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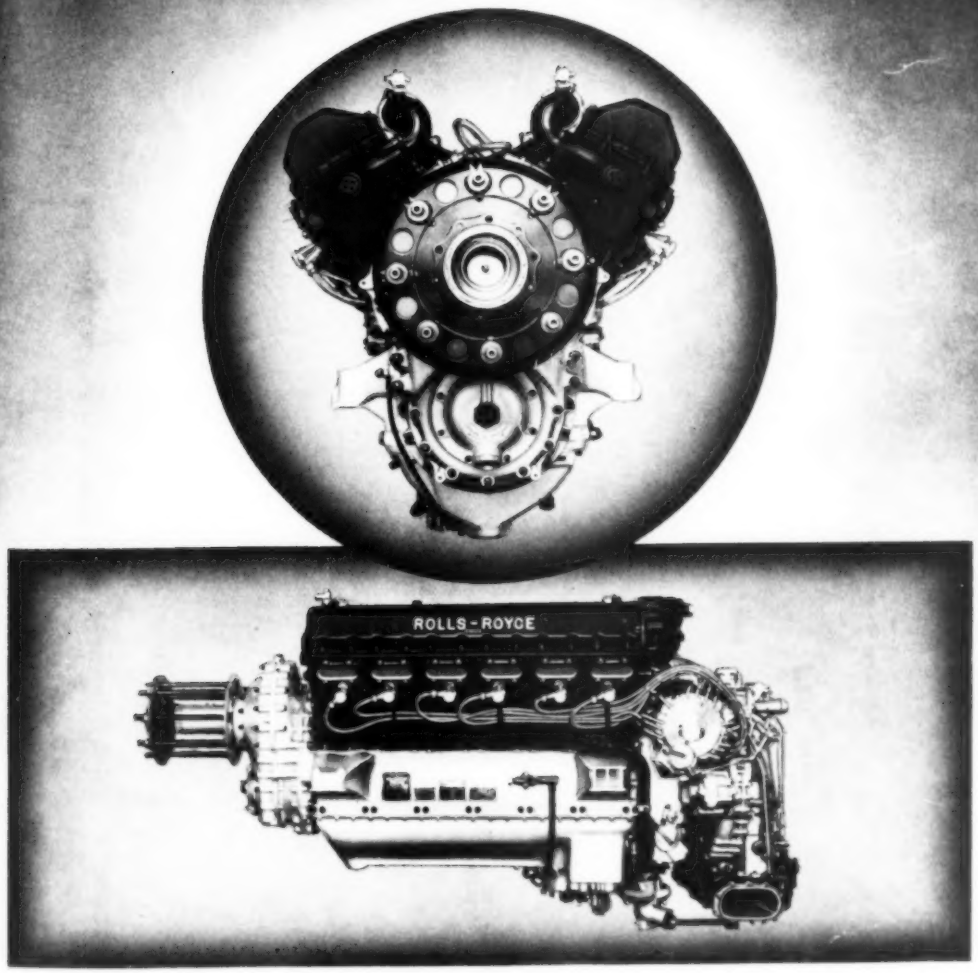

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Five-Year Plan

AT long last the Maybury Committee Report has been published. After reading the document carefully, one is filled with surprise that its compilation should have taken so long. In the main it contains little which was not incorporated, in one form or another, in the notes on the subject of internal air lines compiled, we believe, more than two years ago for the aviation section of the London Chamber of Commerce by Major Ivor McClure, now Operational Adviser to the Director-General of Civil Aviation, and Captain P. D. Acland, now managing director of Westlands.

Those notes were very full of common sense, and it is obvious from the Maybury Report that the Director-General of Civil Aviation has agreed with the ideas of his operational adviser and has carried the other members of the Committee with him. It should be noted that one member of the Committee, Sir Donald Banks, has not been Permanent Secretary to the Air Ministry for very long, and can hardly be expected to have formed as yet any deep-seated convictions on internal air lines, though he certainly knows the Post Office side of the question. It would appear, therefore, that Sir Francis Shelmerdine had to bide his time and could not hurry the other members of the Committee; but it is satisfactory that common sense has triumphed in the long run.

Summarising the main conclusions and recommendations of the Report, the outstanding items are the introduction of a "Junction Aerodrome System," to be operated by one company for a period of five years with Government assistance, and recommendations that the responsibility for all radio facilities, meteorological services, and air traffic control should rest with the Government; that ownership of aerodromes should be in the hands of local authorities or statutory bodies; and that equipment of aerodromes, other than radio, should be the responsibility of the aerodrome proprietors. The Committee does not think private ownership of aerodromes should be prohibited, but calls attention to certain objections.

The scheme outlined is probably as good as any other that could have been chosen. Assistance by the State is unavoidable if a start on rational lines is to be made quickly. Competition is good for trade, according to the old saw, but, if there is little or no trade, competition may be a very bad thing, and a virtual monopoly company may, even if distasteful, be the only solution. Such was found to be the case when Imperial Airways was formed out of four separate companies which had been to some extent competing with each other, and such is likely to be the case with internal air lines, for a start at any rate. There is always a danger when establishing a monopoly company on a very firm footing that when the real need for the monopoly has disappeared the company has secured such a start that private enterprise finds difficulty in competing. The release from the monopoly clause which was agreed upon between the Government and Imperial Airways last year provided an example of how changes *can* be made when good will exists on both sides.

Non-stops and Locals

The "Junction Aerodrome System" can, of course, be criticised. By it aircraft on the trunk routes may fly very nearly over the airport of a city *en route* without landing there, and to get to that city a return on a "local" air line will be necessary. That, however, is not a very serious matter provided the time-tables are carefully planned.

Evidently the Committee has considered carefully the form which State aid should take and has chosen to recommend contribution "in kind" towards getting the scheme going rather than a subsidy for services rendered. That appears sound in principle, particularly in view of the fact that during the early part of the scheme the "services rendered" might, with the best

will in the world, be of relatively small value. The public will have to be educated to use air transport first, and it is during that period that Government aid is especially needed. At present it appears that the big "if" is the provision of the six terminal and one junction airports, in which at least seven municipalities are concerned.

An understandable desire of the Maybury Committee to assist in making "Short-Service" pilots more suitable for air-line operation is evidenced by the Report. It appears, however, that, although the intentions are good, the object is relatively unimportant. It is stated in the Report that it is estimated that the "Junction Aerodrome System" could be operated by sixteen 14-seater aircraft; this does not afford much of an outlet for Short-Service pilots from the R.A.F. and, even if the number of feeder-line or local air-line services grows fairly rapidly, the number of Short-Service pilots who could be absorbed would be infinitesimal in comparison with the numbers now joining the R.A.F.

On the whole, the Maybury Report scheme should form a useful basis for discussion, and the sooner those directly concerned can get down to it the better.

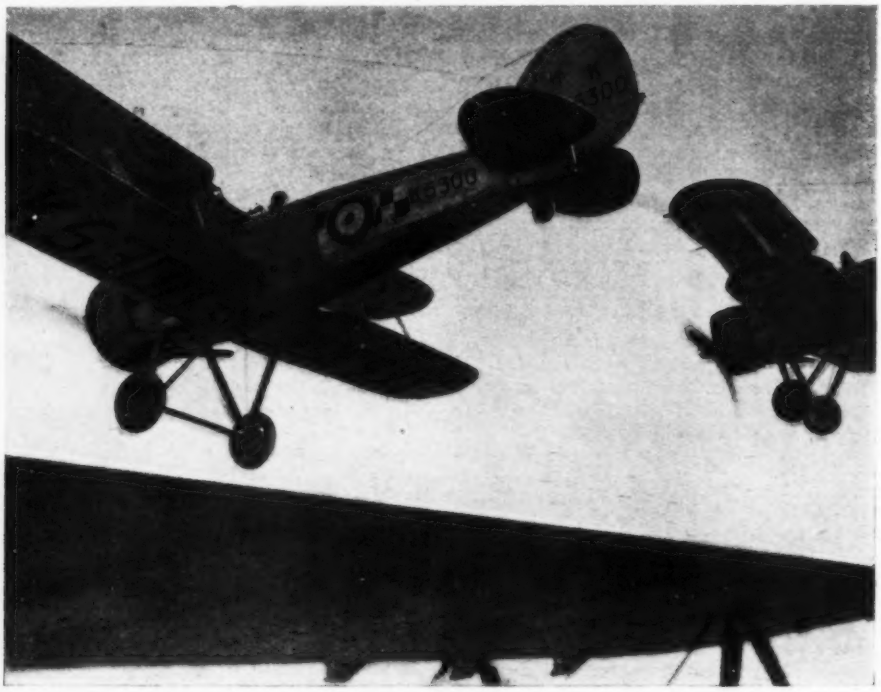
The Defence of Berlin

AIR VICE-MARSHAL COURTNEY and his colleagues must have spent a very interesting week visiting the German flying corps, and our Air Staff is now doubtless digesting their report. This is hardly likely to be made public, and impressions of the visit can only be gained from newspaper men who went with the British party. The special correspondent of the *Sunday Times*, for example, who says that he had been under the fire of German "Archies" during the War, came to the conclusion that "even modern bombers would find it difficult to make much impression on Berlin," and that if the anti-aircraft guns live up to expectations and that if there is effective collaboration with the searchlights, "Berlin has not much to fear from the air."

We can only hope, and hope with great fervour, that this observer is right. If Berlin can be made impregnable against air attack, then so, granted observation posts on the other side of the Channel, can London or any other city. It must always be borne in mind that Great Britain stands to lose most if air attack should prove stronger than air defence, while if the opposite is true then Great Britain is the chief gainer.

In the efficiency of guns, searchlights, sound-locators and predictors, British designers can certainly hold their own. No doubt the German weapons are good; but so will ours be when the new equipment is delivered. Our fighter squadrons are trained to the highest pitch and, according to the observer mentioned above, the German fighter aircraft are far from having reached our standard. That standard is probably the standard of the Gauntlet, not of the Spitfire.

Where the Germans seem to have a great advantage is that they "believe that air defence weapons should come under one command." Of course, our whole air defence is under the *operational* command of the A.O.C. in-C., Fighter Command, but the elements are provided by two different Ministries, the War Office and the Air Ministry. Their training is in two different hands. Some elements are regular and some are non-regular. Such divided control will never be able to make London completely safe against air attack.



"IN THE BOX": The initiated know that this expression means flying behind the leader of a V formation with the arms of the V on either side. It is a good position for observing the quick reactions necessary to keep each machine in perfect formation. Our chief photographer assures us that half an hour in the box with the Gloster Gauntlets of No. 56 (F) Squadron is quite an interesting experience.

The Outlook

A Running Commentary on Air Topics

Lord Swinton on Municipalities

IN opening the Conference and Exhibition of the Aerodrome Owners Association Lord Swinton took the opportunity to discuss the duties of municipal bodies to their ratepayers in the matter of acquiring aerodromes. He commented on the fact that municipal aerodromes do not pay a dividend, and admitted that it might be a long time before they did pay a dividend in cash. But, added the Air Minister, it would be a curious municipality which only provided for cash dividends. A good municipality was one which provided things which would ultimately be useful. He prophesied that those bodies which provided airports would be fully justified in the long run.

Later in the day the report of the Maybury Committee came out, and it says much the same thing. It sums up the matter in the words: "Where civil aviation can serve and thus benefit a locality it is in the interest of the local authorities to make such provision as will enable the inhabitants of that locality to derive the fullest advantages from flying." It would be a good thing to put the word "where" into italics, for in other places where there is little prospect of advantage it would be most unwise for the ratepayers' money to be spent on aerodromes. The Aerodrome Owners Association had asked the Maybury Committee for advice as to the lines where air traffic was likely to move, and other parties who are in doubt whether to buy or reserve land are also anxious for guidance. What they want is a certain number of definite "Don'ts," and these the committee declined to supply.

It may now be taken for granted, however, that interest and effort will be concentrated on the routes suggested in the junction scheme, as the report calls it; and though it is open to any company to start an air line on a route outside that scheme, and to get a licence for it which means a monopoly, the probability is that most people will prefer to wait and see how that scheme works during the five years which are suggested for it. That, probably, is all the guidance which municipalities can expect at the present moment.

The Air and Shipping

IF war should break out again it seems fairly clear that a country which can get its supplies of oil must beat a country which fails to get them. From this it follows that the British Empire is more dependent than ever before on the Royal Navy and its ability to keep British trade routes open to British shipping. Mr. Hector Bywater, the Naval Correspondent of the *Daily Telegraph*, discussed this problem in last Monday's issue of his paper, and came to the conclusion that the prospects of the British Isles are not so parlous as some alarmists would have us believe. The Navy, given sufficient ships and men, is confident of its power to guard the open seas. It is believed that, at least in the early stages of hostilities, international law would be observed, and that there would be no "unrestricted" sinking of merchant vessels by hostile submarines. It has always been the belief of *Flight* that *sensible* rules of war (and the rules concerning merchant shipping are eminently sensible) will be respected, except by belligerents insolent from strength or reckless from despair.

The rules restricting the conduct of a warship towards merchantmen would apply with even greater force to aircraft. They cannot search a ship, and they cannot provide for the safety of passengers and crew. Shipping in harbour, however, remains a legitimate object for air attack. Mr. Bywater puts it: "It will be for the Air Force, working in conjunction with the Army's anti-aircraft organisation, to safeguard the docks and the ships berthed in them." He believes that the problem will not prove insoluble, and it is to be hoped that he is right. If docks can be safeguarded, then so can London.

Dominion Air Forces

IT is gratifying to learn that two of the Dominions are undertaking the reorganisation of their Air Forces, those in question being Canada and New Zealand. New Zealand is probably about to act on the advice of Wing Commander the Hon. R. A. Cochrane, R.A.F., who has been lent to the Dominion. He has commanded No. 8 (Bomber) Squadron at Aden, and his very excellent lecture to the Royal United Service Institution on the situation there will be remembered by all who heard it. Since then he has graduated at the R.A.F. Staff College. His recommendations to the New Zealand Government will be awaited with much interest.

Canada is allotting $11,750,000 for the Royal Canadian Air Force in the coming fiscal year, which is an increase of $5,250,000 over the expenditure in the current year. This Budget will increase the strength of the R.C.A.F. by forty-eight officers and 565 airmen to make a total of 195 officers and 1,498 airmen in the permanent Force. The non-permanent Air Force is also to be increased. An addition of 102 aircraft is to be made to the machine strength, but these will not add much to the strength of any expeditionary force which Canada may decide to send overseas. They include only twenty-four bombers (two squadrons), twelve fighters (one squadron on the old reckoning), and three (so one report says, though it seems hardly credible) army co-operation machines. Flying boats have always been the favourite craft of the R.C.A.F., though they are chiefly used for civil work for the Government. Their number is to be increased by seven. The coast defence of Canada will be strengthened by eleven (a strange number!) torpedo-bombers and eighteen coastal reconnaissance machines, while the balance will be made up of twenty-seven training aeroplanes.

The New Lateral Control

THE first instalment of Mr. P. P. Nazir's article on his new lateral control, published in last month's *Aircraft Engineer* supplement, aroused enormous interest among designers and others, and the continuation, which appears in this issue, has been eagerly awaited.

The results obtained with the Nazir cut slot-trailing flap combination are held by the inventor to be due, to the extent of 50 per cent. at least, to the smooth, unbroken top surface of wing which the combination affords. This seems to be a reasonable assumption, in view of the pronounced effect which diverging surfaces are known to have on the onset of burbling. Work still remains to be done before the value of the device can be fully ascertained, but the very great promise shown by the model tests makes full-scale development appear well worth while.

Flight regrets that it has been necessary to keep readers waiting for the concluding instalment of Mr. Nazir's article, but, as our regular readers know, *The Aircraft Engineer* Technical Supplement is issued with the last issue of *Flight* every month. However, all good things are worth waiting for.

AIRPORTS HIGH-

The Show in Paragraph and Pictur
Gleaned During a Stand-
Central Hall

Illustrated with "Flight

IN last week's issue of "Flight" there appeared sentative items which the various firms were exhibiti following pages, we give personal impressions of "Flight's" staff to what they were

Lord Swinton, Secretary of State for Air, addressing an assembly in the Conference Hall during the opening ceremony.

THERE were fifty-odd stands at the Airports Exhibition, organised by the Aerodrome Owners Association, at the Central Hall, Westminster. The particular hall used was a basement with a somewhat depressing approach, and space was not too generous; but exhibitors made the best possible use of it, frequently resorting to photographs to illustrate products too bulky to appear "in person."

* * *

"WE buy and sell everything connected with aviation," might well have been the slogan on the Airco stand, and a glance at the latest catalogue—sixty-four pages full—would have shown that this statement is no exaggeration.

From the airport owners' point of view the most interesting exhibit was the paraffin boundary light, which has an "endurance" of fifteen hours "on standard tanks." Not only is this type of boundary light self-contained and inexpensive, but it is also manually mobile, so that even the airport with full electrical equipment would still find plenty of use for it while the boundaries were temporarily modified.

The 20,000 candle-power Tilley paraffin floodlights would also interest those who do not at present wish to incur great expenses in the matter of airport equipment—particularly where no volts and amps. are "laid on."

* * *

LAST-MOMENT arrivals at the Show—who for this reason were not dealt with in our advance review last week—were Air Industrial Developments, Ltd., of Shenstone, Staffs. Their speciality is the installation of pneumatic paint-spraying equipment on a large scale, and we were informed that they have actually supplied some 85 per cent. of the big spraying plants used in the car industry. Blackburn, Phillips and Powis, Handley Page and Airspeed are among their customers in the aircraft industry.

The spraying gun used is the Binks, a beautifully designed instrument, for which Mr. Harold Binks, of motor cycle carburetter fame, was originally responsible.

* * *

ANGLOS were advertising the drawbacks attendant on the use of their petrol abroad—which should be good for trade, because the drawbacks concerned were "duty drawbacks," or tax refunds on petrol supplied to aircraft for a journey out of one country into another. They were handing out some useful tips for tourists (regarding travelling facilities, with particular reference to the availability of their products, and not to prospects at Longchamps) and were only too pleased to convince the visitor how good Stanavo really is.

* * *

MANY people who attended various aviation meetings last year must have seen the fire-rescue demonstrations which Bells' Asbestos Company staged.

They are constantly exploring the possibilities of asbestos in fire-fighting, and one of their latest applications is a big screen of asbestos cloth on a wheeled framework. Should an aeroplane catch fire in a hangar, or a car in a car park, one or more screens—which may each measure up to about 12ft. × 20ft.—is pushed between the burning machine and its neighbours, thus isolating the fire until clearance can be effected.

They are working on a scheme, too, for pushing a wheeled, wall-sided asbestos gangway against the fuselage of a crashed and burning aircraft, to allow the rescue squad to evacuate the occupants through the burning wreckage.

* * *

SYDNEY harbour bridge is one of those expensive metal constructions which must be guarded against atmospheric attack. That is why it is painted from end to end with Berger paint, which contains a special protective primer. The same remark applies to the dull green interiors and silver-grey or dark grey exteriors of many R.A.F. hangars.

Paints for interiors need special qualities, and many show panels could be seen, some dead flat, others with a hard metallic polish, and a third type with just that modern half-polish.

A visit to the De Havilland works formed part of the three days' programme arranged for the Aerodrome Owners Association delegates. In this group, wearing a raincoat, is Mr. Ballantyne, D.H.'s South American representative.

EXHIBITION LIGHTS

: Points of Outstanding Interest to-Stand Tour of the Westminster

Photographs and Sketches

classified review, setting out in some detail the repre- and touching on their work generally. This week, in the umewhat lighter nature—the reactions of members of and shown during chats with the exhibitors.

A general view along one of the aisles of the exhibition.

ANOTHER bouquet to Boulton and Paul's for having built one of the most generously proportioned portals out of which an aeroplane was ever trundled. This yawning but readily filled chasm may be admired at Heston, where it gives ingress and egress to the B. and P. hangar lately tailored for Air-work. Yes, tailored is the word, for B. and P.'s will fashion a home for any thing from a strictly private Hornet to a covey of Ensigns. Many of our very nicest aeroplanes live in Boulton and Paul residences, some of the more desirable of which (not that B. and P.'s would consider erecting anything undesirable) were shown photographically.

* * *

AT the British Oxygen Company's stand we learned of the very latest developments in welding, more particularly in regard to the amazing progress that has been made during the last year or two in the welding of alloys. The British Oxygen Company now actually make welding rods for several different alloys of Air Ministry specification.

Apart from hearing more about such interesting application of "bottled" gases as the use of nitrogen for tyre inflation, we gleaned some surprising information about the positively incredible number of industrial gases which the company supplies in cylinder form; it would probably be easier to list those which they *do not* supply!

Not least interesting was the news that they have supplied the oxygen used in recent altitude record attempts, the gas being supplied in specially small cylinders made to Air Ministry specification.

* * *

HOUSEHOLDERS and others accustomed to normal electric light bulbs might well have wondered whether their sight had been upset when viewing the British Thomson-Houston Company's stand. On this were Mazda bulbs eight inches and more in diameter, designed for spotlight and floodlight use, with filaments and their supports on an engineering scale comparable with that of the new Chelsea Bridge.

The latest spotlight bulb—shown in 2, 5 and 10 kilowatt sizes—is known as the "bipost cap" type, and in this the terminals are built into a glass base which is welded to the special heat-resisting globe. There is, consequently, no metal cap base as normally used, and a possible source of failure, due to heat expansion and so forth vanishes.

* * *

LAST-MOMENT takers of stand-space at the exhibition were the British Standards Institution, who had a model of Croydon aerodrome to illustrate the installation of lighting to B.S.I. specification; the touch of a switch transformed the scene from daylight to night.

* * *

THOSE famous factors, Brown Brothers, are out to ease the burdens of the G.E.'s working life. A metal case could be seen, containing a brace-type spanner with extension and with universal joint attachment, and a dozen or more adaptors to fit all sizes of nuts. Again, lightweight electric drills to ease the aching arm were on view. Jacks and trestles, to lift and hold, have various different supports to suit any job, and a vernier-type scale indicates the height.

To carry service one stage farther, Brown Bros. are always pleased to submit internal and external lighting schemes without obligation.

* * *

TO most people one wire is as good as another, so presumably one cable might be thought as good as another; but in jobs like electric welding in shipyards, where surroundings are chiefly salt water and rough concrete, something special in cables is essential.

For outdoor use special Callendar hard cord interwoven "overcoats" give efficient protection, and a most important claim is that, despite the overcoat, handling of the cable is quite effortless. All standard sizes are available with smooth or hard cord braided finish.

Mr. R. Ashley Hall, chairman of the Aerodrome Owners Association (in dark overcoat), leads a procession during the Hatfield visit.

***Flight* photographs provided the decorative *motif* on our own stand.**

THE Cellon people are the kind of dope peddlers who are welcome in society, particularly aeronautical society, for not only do their wares make for brighter and better aeroplanes, but the roof of the Kingston factory is so marked as to receive the benedictions of erring airmen.

They had some interesting facts to impart. For instance, the discovery of an entirely new basic material, viz., synthetic resins, resulted in the evolution of new and improved types of decorative finishes, quite distinct from cellulose and fundamentally different, they explained, from the old types of natural gum and oil paints and varnishes.

* * *

COINCIDENTALLY forestalling the Maybury Committee Report, which turns down London Central Airport proposals, the Cement and Concrete Association has been thinking of ways of bringing Croydon nearer London. On their stand was an artist's conception of an all-concrete elevated road from Croydon to Victoria, with new Thames bridge.

The idea is, perhaps, not so far-fetched as it may seem, and the Association—which represents interested firms—has drawn up some sound schemes in the past. Application from responsible enquirers to 52, Grosvenor Gardens, London, S.W.1, will bring "Concrete in Aerodrome Construction," a really notable brochure.

* * *

SINCE airport lighting is, to a large extent, standardised, it was good to find something out of the ordinary on Chance Bros.' stand. This was a new sound-absorbent, insulating and heat-resisting material known, aptly enough, as glass silk. It can be produced either in the form of loosely woven cloth (to be handled with considerable care) or as stiffer finely woven sheets, and is made entirely of glass thread of unimaginably small diameter.

The cloth can be used for cabin-silencing, pipe lagging and fire-resisting bulkhead covering, while the sheets have a number of similar uses. Interesting, too, though not particularly in the airport world, was the heat-absorbing Calorex glass. This passes 70 per cent. of the available light, but only 3 per cent. of the usually resultant heat. Good for squash-court skylights and the like.

* * *

THE firm of V. L. Churchill and Co. who had, *inter alia*, a display of box spanners smaller, larger and more numerous than we ever imagined existed, obligingly refaced a valve for us (let that not be misunderstood—it was their valve) in the Churchill valve re-facer. This is a motor-driven tool which feeds the slowly revolving valve up against a high-speed Aloxite wheel. A range of face-angle adjustments is provided, and the machine has a stem capacity of $\frac{1}{4}$in. to $\frac{3}{8}$in. It is used by the Air Ministry and leading aero-engine firms.

Following recent personal experience with personal motor-car valves in an elderly lathe with a blunt re-facing tool, the demonstration made us genuinely envious of anyone whose job it is to use the Churchill method.

* * *

UNINTERESTING at first glance, since it appeared to consist merely of show-cases of earth and bottles of a rather unpleasant-looking liquid, the display of Colas Products, Ltd., was actually of immense interest when their process of earth stabilisation was explained.

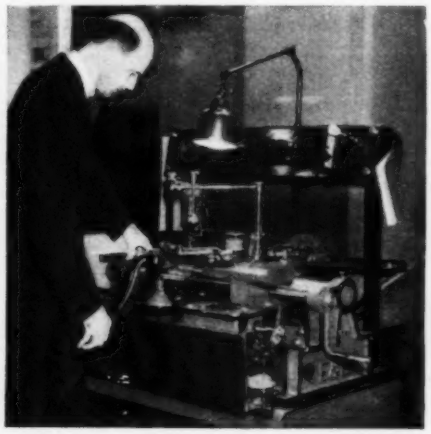
Roughly speaking, the Colas system involves the harrowing of any required part of an aerodrome surface, mixing of the soil with a bituminous emulsion, and consolidation. This results in an impervious, dustless and infinitely durable surface. Anyone who has seen the apron at Southampton airport will know how the result appears.

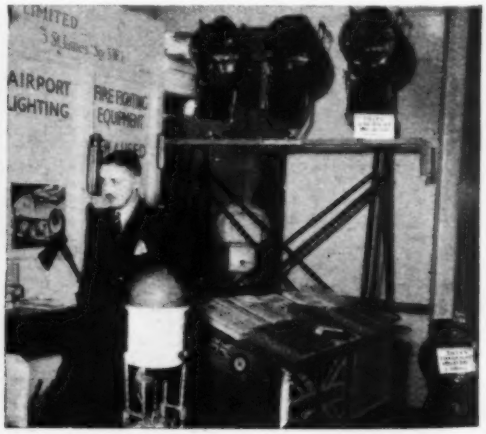
One interesting possibility of the Colas process has been exploited at Kelly Field, U.S.A., where the runways are top-dressed in alternate light and dark shades to give good visibility under difficult landing conditions.

* * *

ON Stand 38 we achieved an ambition by drilling a hole in a $\frac{1}{4}$in. mild steel plate with one of Desoutter Brothers' really amazing little portable electric drills—$\frac{1}{4}$in. capacity, weight only $2\frac{3}{4}$ lb., and the finish, balance, and feel (this is no exaggeration) of a good automatic pistol. Then Mr. C. Desoutter, using all his strength, tried to "stall" the drill. It did not seem to mind.

We cannot resist mentioning the 1 c.c. two-stroke model aero engine which Mr.





(Left) One of the most popular demonstrations in the Show was of the "Magnaflux" crack-detector on the stand of the Equipment and Engineering Co., Ltd. The ferrous part to be tested is coated with a special fluid and placed over the poles of an electro magnet, when the most minute cracks immediately become apparent.

(Right) Mr. S. J. Gilbert of Airco, Ltd., among a few of the innumerable things—including paraffin floodlights — which the company handles.

Desoutter has built as a hobby, and which we induced him to demonstrate (doubtless inviting the grave displeasure of Mr. Gillman, for it formed such a grand counter-attraction). It is the smallest and most perfectly finished miniature engine we have ever seen.

But that is by the way. And so is Mr. Desoutter's story of the burglars who broke into his works. With designs on the safe, they tried to connect up a Desoutter pneumatic drill with the electric supply. . . .

* * *

THE upper half of the light spectrum plays havoc with the colours both of the physiognomy and the old school tie, and visitors to the Edison Swan Electric Company's stand suffered a terrifying metamorphosis. This stand was lit by two high-power mercury vapour lamps, and it was in the value and operation of these that we were particularly interested.

Since these lamps are claimed to be over one hundred per cent. more efficient, light for wattage, than the normal filament type, this minor disadvantage can be forgotten when it comes to the business of lighting airport approaches or large workshops. At present, such lamps—which are virtually arc lamps in which the arc is formed of incandescent mercury vapour—cannot be satisfactorily made in very small sizes, but experiments are going on, and within a few months Ediswans will probably have miniature mercury lamps on the market.

* * *

MANY Exhibition visitors must have had their memories stirred, painfully or otherwise, by the name "Educational Supply Association" over Stand 22. And there *is* a link. Those concertina partitions which screened the Upper Fifth from the rude gaze of the Lower Third have grown into 200ft. × 35ft. "Esavian" hangar doors at such aerodromes as Filton, Speke, Reading (in hand now), Karachi, Calcutta and Bombay.

As could be seen from a working model (or, if you refused to believe that, a baby ciné film taken at Filton) electric motors propel the wheeled doors quickly and sweetly along their guide rails, stopping at the command of automatic cut-out switches. The doors retain a slight zig-zag surface when fully closed, this acting as a wind-break which deflects pressure on to the upright post between each leaf.

* * *

WE believe we are right in assuming that the firm of En-Tout-Cas owe their picturesque title to their activities as pioneers of hard tennis courts.

"In all cases" or "At all events"—translate it as you will—the name is equally descriptive of their wider activities nowadays, which cover every form of aerodrome construction and building. Laying-out, reconditioning, draining, erection of buildings—they are prepared, it seems, to tackle any proposition.

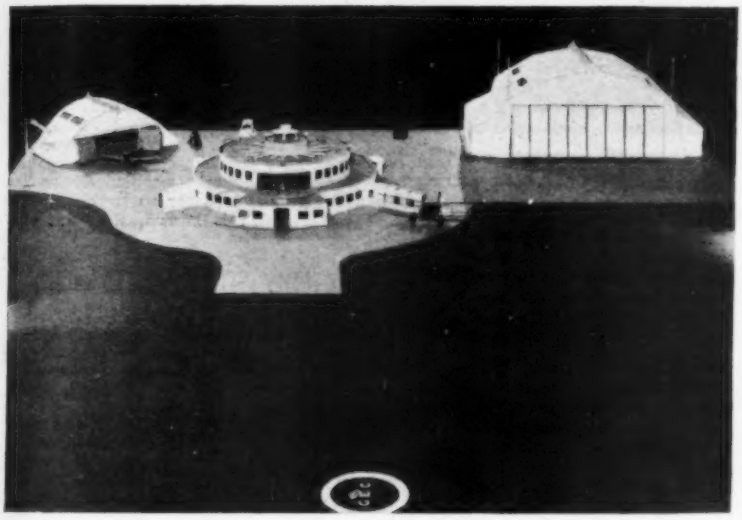
Extensions at Filton and Heston, complete constructional works at Yatesbury, Lee-on-Solent, Leicester, Shoreham, Ratcliffe, Reading and Woolsington; these were some of the famous aerodrome names which we heard on Stand 4.

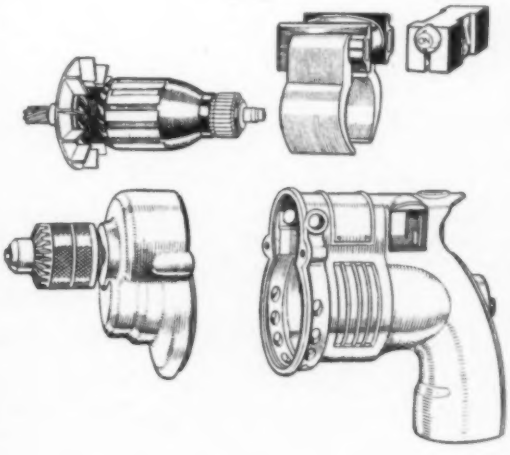
* * *

QUITE one of the most popular demonstrations in the Exhibition was of the "Magnaflux" crack detector on the stand of the Equipment and Engineering Co., Ltd. This apparatus provides a most quick and ingenious method of bringing to light faults in any ferrous metal, and we were reminded that it is in great demand among engine manufacturers, such as the Bristol Company, who use it at all stages of manufacture. "Magnaflux" equipment is also supplied to the Air Ministry and to an extraordinary number of Governments abroad, such as the Australian Air Force, Canadian National Air Defence Force, Indian Civil Aviation Department, and Egyptian, Dutch and Lithuanian Air Forces.

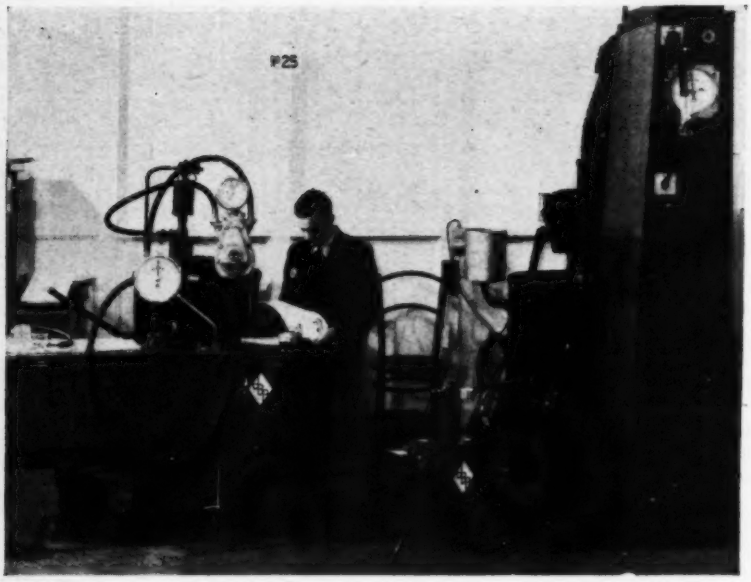
The firm also showed aircraft supporting jacks of the type which have long been popular in America, but which have not, as yet, been widely adopted in this country.

Mr. Frank E. Buckell, A.R.Ae.S., who is in charge of the aeronautical electrical side of G.E.C., with his colleague Mr. G. M. Trundle. They are looking thoughtful about the Company's airport model (left), in which every item of lighting equipment was represented; trees, radio masts and floodlights were in the foreground, but are not included in this photograph. An interesting point is that the 3½-volt bulbs of the dozens of obstruction lights were each no bigger than a grain of rice, and were actually of the type used in surgical investigations.





One of the many practical points about the neat little Desoutter electric drill guns is the fact that there are no internal wiring connections, contacts such as those which can be seen on the field magnets providing the necessary current conveyance.



Assorted equipment on Thos. B. Pillin's stand, including (left) a 50-gallon transportable oil unit, and (right) a new quick-delivery petrol pump with "disappearing" delivery pipe.

PAINT-SPRAYING equipment for aircraft works use must be light and portable, and other desirable features are simplicity of design and operation, elimination of moisture in the air line, and absence of paint fumes. Kurt Erlach's Volspray models can claim all these characteristics; at the same time they have low-pressure operation so that the motor need only be about ½ h.p. as compared with the usual 1 h.p. or more. The most popular little ensemble, the IA/2 type, has been supplied in large numbers to the Air Ministry and also to Imperial Airways, De Havillands, and Supermarine.

* * *

AT the Exide stand Mr. Stanley Brown, of the firm's Technical Aircraft Sales side, told us some things we didn't know about batteries. For instance: You can *dis*charge a battery as fast as you like, by shorting or otherwise, without damage to the plates, the limiting factor being the load of current the connector bars can stand. (Exide aircraft batteries have copper bars.)

He told us, too, of a certain experimental battery, to an Air Ministry specification, which was carried into the near-stratosphere. A too-small vent-hole became choked. The gas in the interior rebelled against the abnormally low atmospheric pressure outside, and the battery burst, with most expensive consequences to the aircraft structure.

Latest Exide aircraft batteries have some ingenious features; and, talking of ingenuity, Mr. Brown showed us a thin, parallel-sided electric torch designed for inspecting the interior of metal tubing; there is even a ring by which to lower it on a length of string.

A little too big for the Show—one of the National Benzole Company's tankers in action on an aerodrome.

FREIGHT-CARRYING aeroplanes have been called upon to carry all sorts of genuinely heavy loads, as instance the heavy machinery and ore habitually transported by the Junkers G.31s of Guinea Airways.

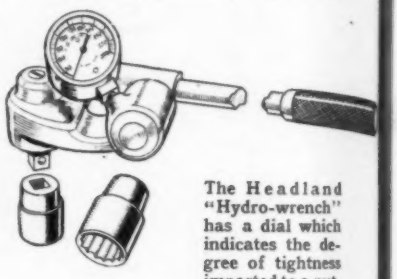
In such work—and, one presumes, for loading less peaceful machinery into more uncivil aircraft—the chain hoist (descendant of the rudimentary block and tackle) can find a place as permanent equipment in the aircraft.

Felco Hoists, who persuaded us to lift the odd half-hundredweight with two fingers, claim that their chain block exactly fills this bill, because the headroom required is practically nil, and because the weight is so low. A half-ton equipment weighs only 34lb. and a one-tonner only 52lb., both with chain for a ten-foot lift.

* * *

ALTHOUGH still to make their name in the conservative world of aeronautics, Gambrells, Rowse and Snoaden have been manufacturing marine and other radio installations for a number of years.

The firm's experience with sets designed for the rigorous conditions of marine use should be valuable now that they have turned their attention to aircraft radio work, particularly as the Empire routes cover so much of the world which is known, for want of a



The Headland "Hydro-wrench" has a dial which indicates the degree of tightness imparted to a nut.

better word, as "tropical." If all we hear is true, many of the more modern and luxurious vessels are subject to all manner of vibrations, and Gambrells' experience with this type of installation will not be without its value when they turn to aircraft—wherein the vibration is of a higher frequency.

* * *

A WIND indicator which has been adopted for use at nearly all the German airports and at Croydon, Le Bourget, Hendon, Gatwick, Yatesbury, Shoreham and Hanworth must "deliver the goods." Actually, the aforesaid goods take the form of a steady stream of white smoke which, trailing out across an aerodrome, indicates the exact direction of the wind. The oil-vaporising apparatus responsible is the G.A.L. Smoke Trail, which was introduced to the public at the Exhibition. A hinged manhole cover stressed to deal with the landing impact of an aeroplane wheel-load of up to ten tons shields the subterranean smoke-brewing device.

* * *

A FIRM which has such world-wide connections as the General Electric Company should be in a particularly handsome position when it comes to offering tenders for work overseas, and, during the coming few years or so, airline expansion should keep them busy.

On the G.E.C. stand was an imposing list of installations already carried out, with an ingenious sign and key system to show at a glance just what equipment has been erected—whether floodlights, boundary lights, neon signs, or a complicated combination of them all. The list covered aerodromes in all parts of the Empire, and was likely to be more impressive to the average prospective customer than any display of equipment, however magnificent.

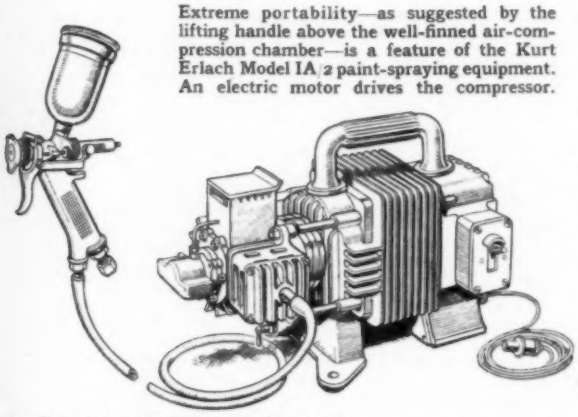
* * *

IT would take a well-developed fire to resist the two hundred and forty gallons of foam and gas produced by a 30-gallon Bromylene extinguisher as shown on the General Fire Appliance Company's stand. A long-range model this, ejecting to a distance of 70-80 feet. All R.A.F. stations have one.

The cylinder lies horizontally on a new type of low-built chassis and, while remaining stationary on its seating, is operated by one man. The foam and gas mixture is introduced to the conflagration through a 30-foot hose.

* * *

WHAT particularly took one's fancy among the comprehensive display of portable and bench machine tools on the Grimston Electric Tool Company's stand was the Electriska bench and column drill, a semi-production tool with capacity up to one inch. In its squat, compact design it is a million times removed from the spindly, pulley-and-belt-decorated drilling machine of a few years ago. It offers four alternative speeds. Moreover, a battery of four of these drills is obtainable on a bench, so that very quick repetition work, drilling holes of four different sizes, is possible.



Extreme portability—as suggested by the lifting handle above the well-finned air-compression chamber—is a feature of the Kurt Erlach Model IA/2 paint-spraying equipment. An electric motor drives the compressor.

* * *

THE firm of John Hall and Sons, Ltd., of Bristol (of whom Mr. R. Ashley Hall, chairman of the Aerodrome Owners Association, is a director), told us something of the enormous amount of business the firm is doing in decorative paints in connection with aircraft factories, hangars, etc. The London Gliding Club's luxurious new premises at Dunstable may be cited as an example.

It was rather surprising to find that even decorative paint has to be made to Air Ministry's specification and to respond to tests such as the scratch test, which involves drawing the coated surface under a gramophone needle carried in a loaded arm, the weight required to mark the surface then giving the datum figure.

The engine and airscrew of the Bristol 138 monoplane which regained the altitude record for Britain was finished with Hall's paints.

Yet another point of interest gleaned here was that Elektron has a "greasy" quality to which paint will not normally hold; but Hall's seem to have solved the problem.

* * *

ON Stand 40 Thos. P. Headland introduced their very ingenious "Hydrowrench," which is the material answer to several difficult questions with regard to tightness of nuts, gasket failure and oil leaks. It is quite fool-proof and very light and simple; the user just places the adaptor on the nut to be tightened and pulls the handle until the needle points to a figure that the works nut-tightener-in-chief has decided is the right one; then he starts on the next nut, and so on. All the nuts will thus be at the same tension and the tension will be the correct one.

* * *

A JACK is an instrument that seldom receives credit for a good job done, but is roundly admonished for a failure to work, or a breakdown when in use. However, the dozen or so models marketed by Ernest Lake, Ltd., should be most dependable. A double gear provides quick or slow lift, while lateral strain is taken on the tubes rather than screw, and the lifting thrust is taken on

The most interesting feature of the Marconi stand was the short-wave D/F unit, seen in this view on the extreme right. These receivers will be installed at the stations designed to cover the Atlantic crossings. (*Flight* photograph.)

Belfast Harbour Commissioners' delegates to the Airports Conference: (left to right): Mr. J. H. A. Patton, Mr. W. Y. Chamberlain, Air Comdre. J. A. Chamier (permanent nominee in the Airport Owners Association), Mr. James Alexander, and Mr. M. J. C. Stanley.

"Meet our new waste-engine-oil collector"—Capt. C. C. Clark of Tecalemit effects an introduction.

large balls at the base of the jack. Air Ministry work undertaken by this firm also includes orders for bomb hoists, torpedo trolleys, pop riveters, gantries, and tail skids.

* * *

A STRAIGHT-LINE jet or a wide, diffused spray under a pressure of 375 lb./sq. in. is uncompromising with grime, which means that the Laycock Niagara washing plants are handy things to have around the 'drome. The pump of the particular Niagara model on show was a three-throw type with solid stainless steel plungers, a bore of 1¼in. and a 2in. stroke.

* * *

THOSE with tendencies towards film-fanaticism know how the imaginative producer "tracks" or "pans" his camera down on to the scene from unlikely angles. The secret, more often than not, is an impressive piece of studio apparatus known as the camera crane. Again more often than not, and certainly whenever any extra-special camera mounting is wanted, the crane is built up from steel scaffolding.

All of which seems to have no bearing on aviation—until it is said that Mr. G. E. Kidd, whom we found in charge of the London and Midland Steel Scaffolding Company's stand, used to be responsible for such studio engineering with a very famous film concern; and that he told us how such constructional problems as arise in film studios are constantly being solved by the L. and M.S.S. Co., who are equally interested in the requirements of the aircraft, shipbuilding, building and many other industries. No matter how large or how awkward the shape of your "giant air-liner," these good people can, it seems, suggest the appropriate sort of assembly staging for it—and on wheels at that.

* * *

THE greater use of short waves for long-distance communication over the Empire routes has meant, of course, that special equipment has had to be developed for the purpose. Last year we saw the equipment for the Short Empire boats, and on the Marconi's Wireless Telegraph Company's stand was a short-wave direction-finding unit for ground stations. These will be used, incidentally, for the Atlantic services and cover a waverange of 15 to 200 metres.

The Marconi-Adcock short-wave D/F aerial system covers a very much smaller area in three dimensions than that for medium-wave reception. Only four thirty-foot self-supporting masts are used, these being spaced in an area about twenty feet square. Those who enjoy and who understand such expressions as "coupling," "phasing," "heptode mixer" and "pentode amplifiers" will be better able to follow the technical points in this new and interesting piece of equipment.

* * *

DON QUIXOTE charged windmills and got hurt; the National Benzole people charge ovens and get petrol. By turning coal into coke they liberate benzole—in a gaseous state and mixed with various substances from which, by a variety of processes, it has to be freed. A demonstration panel permitted study of how National Benzole is, as the producers put it, "won from the mighty British industries on which the nation's greatness and the prosperity of its people so vitally depend."

* * *

THERE comes a time when every aero engine needs a complete overhaul; and at that time such helpful equipment as Newton Brothers' repair accessories is invaluable. Accuracy of boring and facing is assured by the jigs, and alignment and clearance in bearings is checked and fixed correctly to the *n*th degree. Demonstrations and instruction in the use of equipment can be arranged, but simplicity of operation is the keynote.

* * *

"DULUX" is no proletarian finish. In the words of its manufacturers, Nobel's, it is a type which cannot be classified with any existing oil cellulose or synthetic resin finish at present on the market. One of the variations is officially designated "Dulux humidity and fungus-resisting enamel." Woe betide any ambitious fungus with designs

The new Castrol oil dispensing unit is built on petrol-pump lines.

Mr. H. Long, a director of Short and Mason, Ltd., of instrument fame, explains a point to a visitor.

on its surface, for it contains a potent fungicide.

* * *

"DO you know much about painting?" we were asked, and on modestly answering in the negative we were invited to try what an amateur could do with the Northern Aluminium Company's Noral paste. A sample tin of the paste was produced, and a fraction, taken on the point of a knife, was mixed with a medium on a glass pallette, producing in a few seconds a brushful of aluminium paint.

Then, equipped with a board and brush, we daubed away happily, completely and uniformly covering a strip of the wood. Our satisfaction, however, was short-lived. It was the paint that was good, for on trying again with ordinary white paint, lines, brush-marks and bits left out, made the new effort look a sorry sight by comparison.

* * *

ILLUSTRATED on page 74 of last week's issue of *Flight* was the Dagenite starting battery trolley, and for those who had not already made its acquaintance at Croydon or elsewhere examination of the actual equipment on the Peto and Radford Stand was interesting.

Apart from the striking number of discharges at a high rate (figures which have already been quoted in *Flight*) one was taken by the number of practical little fittings—a spotlight to help the operator to find the connector socket on an aircraft at night, pneumatic tyres, brakes applied automatically on release of the pulling handle, anti-short-circuit safety lid, fire-extinguisher, and so on.

The Dagenite people stated that 75 per cent. of civil aircraft are fitted with their equipment.

* * *

A WORKMAN will think more kindly of a general-purpose oil pump or compressed-air motor if it needs little or no effort to move about when required. It appears that this point, among others, was borne in mind by John B. Pillin, Ltd., when their several balanced pumps and compressors were designed. Rubber-tyred wheels and castors make simple the task of moving the machines from one job to the next. Even the feed pipes from the pumps are counter-balanced and retreat hurriedly into their cases when released.

ONE of the most handsome examples of show literature available for the taking was *Conquest—In Every Element*. This work chronicled, in text and picture, some of the major achievements of Shell-users, on land and sea and in the air, which punctuated the past year. Shell petrol, "B.P." Ethyl and Shell lubricating oils have ensured the powerful, smooth operation of some of the finest pieces of record-breaking mechanism.

* * *

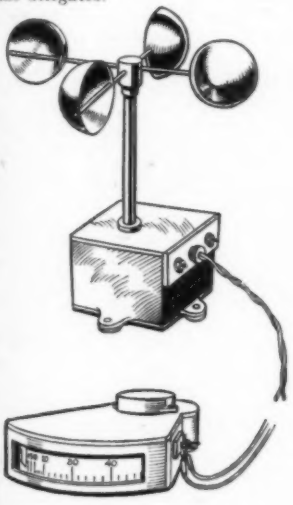
AMIDST a galaxy of instruments designed especially for recording atmospheric conditions, and thereby enabling clever people to prophesy likely changes in these conditions, one quite modest little device on the Short and Mason stand appeared to be worthy of special attention. This is an electrically operated direct-recording anemometer, or wind speed indicator.

The outfit consists simply of the normal cup-type anemometer with a self-contained "generating station" at its base, a length of flex, and a recording dial.

* * *

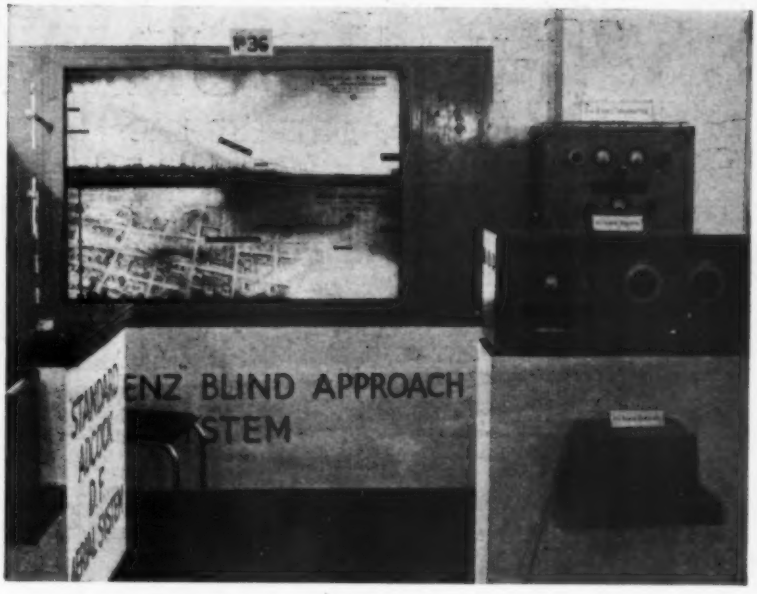
ALTHOUGH not in mechanical operation until the second day of the Exhibition, the Lorenz blind approach demonstration panel was the centre of interest on Standard Telephones and Cables' stand.

In this, shadow model aeroplanes travelled over two diagrams, one showing the glide path and the other the approach line, while the normal dashboard instrument gave the appropriate indications as the machine left path or course on its way in. Mr. Tomlinson, of Standards, gave an interesting talk to the delegates.



"Remote" readings of wind speed are given by the Short and Mason anemometer, with its electrical connections to the recording unit.

We learn that the company's latest flying laboratory, a Heston Phœnix, is almost ready for use by their demonstration pilot, Mr. Auping. In addition to a Lorenz receiver, this machine will have a most useful array of equipment for blind-approach demonstrations and tuition.



The short-wave approach demonstration panel was the key exhibit in the Standard Radio display. In this, to the veiled horror of transport pilots, the approach was shown, for good reasons, as being made over a heavily industrial area.

THE seed germination testing laboratory of Sutton and Sons is personally supervised by Mr. Martin A. F. Sutton. The story began way back in '55, when Mr. Martin Hope Sutton was entrusted with the collection of growing grasses by Royal Command. At this time it was usual to set park-lands with seeds swept from hay lofts, containing a large percentage of weeds, so Sutton's introduced the first regulated mixture of grasses and clovers. This was the forerunner of modern turf prescriptions, such as those which play a large part in deciding the success of an aerodrome surface.

* * *

"FILLING a big bomber in Mesopotamia we used to reckon to lose four to five gallons by evaporation." Thus Capt. C. C. Clark, manager of Tecalemit's Government Services Department, explaining the firm's new refuelling equipment which traps vapour and, through a second hose, sucks it back into the bulk storage tank almost faster than it is generated.

Tecalemit seem to make every imaginable sort of gadget for administering grease, oil and fuel. A new one is ingenious and, like most ingenious things, simple. It is merely a ten- (or twenty-) gallon drum on a trolley, surmounted by a funnel on an extensible cranked arm. Wheel it under your aeroplane, adjust the funnel, drain tank or sump, and wheel away. Which is a very simple way of banishing those biscuit-tins of old oil which everyone falls over.

* * *

YES, "mobile" is the word for Thompson Bros.' refuelling tenders. Anyone who gets round and about the aerodromes will tell you how these amazingly capacious little fellows can shunt in and out of aircraft parking lines purveying their petrol. Independent and racy they are, too, with their own hoods, searchlights and electric lighting. *Bluebird* bodies and three-wheeler chassis. And what performance: the Mark III will deliver at one sitting, so to speak, 500 gallons of air-free, filtered and metered spirit at the rate of 45 gallons a minute against a 20ft. head.

* * *

THE Vacuum Laboratories contributed a nice array of tubes full of oil. So what? So that one might mark the superiority of Aero Mobiloil Red Band over "Oils No. 1, 2 and 3." There, before one's very eyes, was evidence of how this quartet of lubricants faced the ordeal of oxidisation for four hours at 230 deg. C. and periods of eight hours and twelve hours at the same temperature.

* * *

WHY should oil be dispensed from insignificant, unsightly barrels and pumps? Why, indeed, say C. C. Wakefield and Co., Ltd.; so they are serving up Castrol from a right noble unit designed to harmonise with petrol pumps. Not only is this arrangement desirable from an aesthetic viewpoint, but it avoids all risk of contamination.

Three alternative operative methods are available: an air-pressure tank, air- or electrically operated pumps. An intriguing device known as an anti-milking valve is incorporated to comply with Board of Trade regulations. This prevents oil being obtained from the hose.

* * *

EVERY air-field proprietor would be proud to think that each blade of his grass had a pedigree. This is hardly an exaggeration. To obtain grass with that wiry fineness of a seaside golf course, that matting of roots, the ground must be cleared, prepared and fertilised, then sown with the best of "pedigree" seeds bred and blended in the nursery. This ideal, we learned, has been achieved. The correct percentage of such picturesquely named grasses as Agrostis, Festuca and Yarrow is assured in mixtures from the famous seed house of Edward Webb.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

BATTLE JUNIOR—TOP OF THE CLASS: The new Fairey light bomber with Rolls-Royce Merlin engine of 1,000-plus h.p. In general layout this type—which is probably the fastest single-engined bomber in the world—is reminiscent of the Battle medium bomber but is six feet shorter in span and carries a lighter load. The undercarriage is of a different design, retracting inwardly instead of rearwards. Dive bombing is likely to be one of the new machine's main duties.

(R.A.F. official photograph, Crown copyright.)

SLEIGHS powered with aero-engines are being used extensively for mail delivery in the Kamchatka Peninsula.

Mr. Baldwin, in the House last Tuesday afternoon, announced that the Government had decided to abandon the strongly opposed White Waltham (Maidenhead) aircraft factory project.

It is reported that the Air Ministry is experimenting with the Cambridge exhaust gas analyser with a view to adoption on Service aircraft. The instrument was described in *Flight* of January 14.

To-night, before the Royal Aeronautical Society, Dr. N. A. de Bruyne, Fellow of Trinity College, Cambridge, and director of Aero Research, Ltd., will lecture on "Plastic Materials for Aircraft Construction."

Mr. Howard Hughes, using a modified version of the monoplane in which he set up the present world's landplane speed record of 352 m.p.h., flew from Los Angeles to Newark, New Jersey, in 7 hr. 28 min. last week, averaging 332 m.p.h. He made the previous fastest time in a Northrop.

Twenty-five Years Ago

(*From "Flight" of January 27, 1912.*)

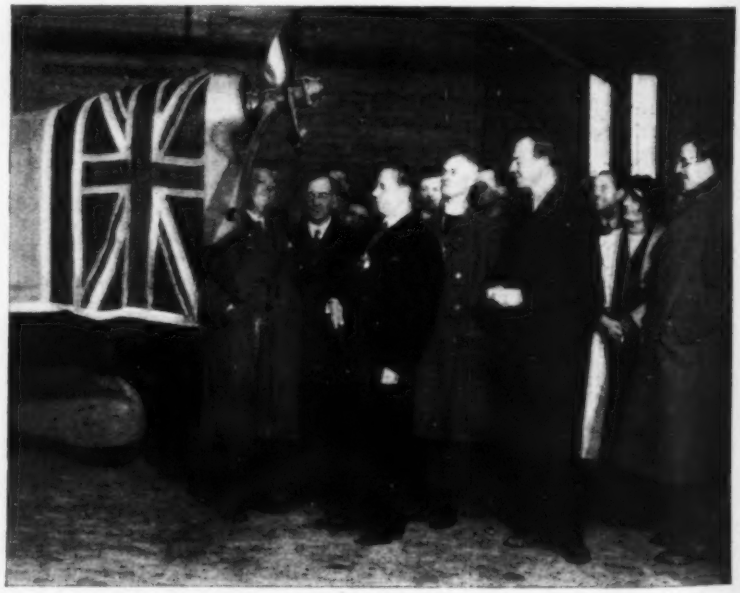
"Being dissatisfied with the action of the Government regarding military aeroplanes, Vedrines, on Saturday afternoon, secured a large number of bills bearing words to the effect of 'Give France More Aeroplanes,' and starting off from Issy he flew over to Paris, where he scattered a plentiful supply of the bills over the Chamber of Deputies. The query arises, will he be proceeded against under the new regulations prohibiting the throwing of paper about the Paris streets."

The first Alvis aero-engine will be on test by the end of this month and is expected to commence its Air Ministry type test soon after.

In place of the advertised R.Ae.S. Students' Section lecture next Tuesday, February 2, Capt. J. Laurence Pritchard is to lecture on "Bird Flight in Relation to Aircraft Engineering."

The Air Ministry has made preliminary tests with the French Dewoitine D.510 monoplane with Hispano Suiza "cannon" engine.

The date of the next indoor flying meeting organised by the Society of Model Aeronautical Engineers at the Royal Albert Hall, has had to be advanced from February 9 to February 2.



CEREMONY: At the new Percival works at Luton, and in the presence of the Mayors of Luton, Monmouth and Abergavenny, Mr. David Llewellyn's Vega Gull was last week christened *County of Monmouth* by the Mayor of Newport. The machine, which has a Gipsy Six Series II engine and v.p. airscrew, will be used for a Cape record attempt. It would appear that one of the distinguished visitors involuntarily shared the Vega Gull's champagne bath. (*Flight* photograph.)

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The AIRCRAFT ENGINEER

"FLIGHT" ENGINEERING SECTION

No. 132 (Volume XIV No. 1) 12th Year January 28, 1937

IMPROVED LATERAL CONTROL

By PHIROZE P. NAZIR, M.Inst.B.E., A.F.R.Ac.S.

(*Continued from page 39*)

FEW discoveries of recent times have caused more interest than the cut slot and trailing flap control combination devised by Mr. Nazir and tested in model form at the Queen Mary College under the guidance of Dr. N. A. V. Piercy. The rolling moments obtainable at angles beyond the stall are far greater than any hitherto recorded, as far as we are aware, and the invention certainly appears to merit the closest investigation. As a first step it is suggested that the model should be tested for drag, and following that a wing should be built and tested in flight on a full-size aeroplane. It is to be hoped that Mr. Nazir will find the means of carrying out such a programme—ED.

The System of Control at all Speeds

AN aeroplane in the course of a flight is called upon to vary its incidences considerably in order to fly at both high and low speeds. The aerodynamic requirements, however, are fundamentally opposed for the two cases of speed, and consequently two different classes of device, used separately, have hitherto been found necessary at different speeds, namely :—

(1) Flaps which are effective at high speeds.

(2) Slots which are called into play at speeds near the stall.

Each of these devices is useful only in its individual limited sphere and cannot be utilised outside it. It is a well-known fact that the front slot itself reduces lift at the smaller incidences and, therefore, is not efficient at high speeds. The flap, on the other hand, is not good at slow speeds. It occured to me that a single control device, consisting of a combination of flap and slot could be designed for use at all speeds. This is now possible by using the flap at small incidences and the slot at large angles only with greater movement of the control column. Proper synchronisation of the slot opening is essential so as not to reduce lift at small incidences.

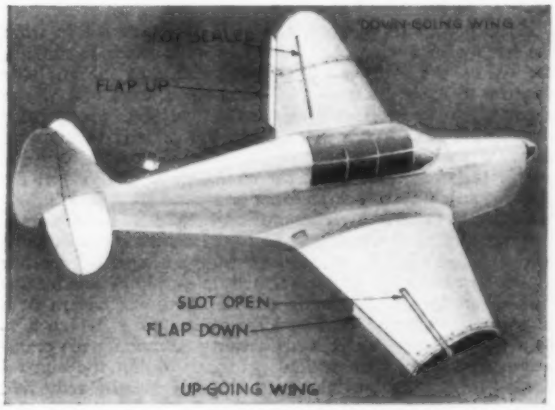
Effect on Control of Stalling of Tapered Wings

It has been shown recently by experiments with tapered wings, both in the wind tunnel and at full scale, that they are subject to a much earlier and more rapid stalling than rectangular wings. It has also been found that the area occupied by the early stall is mostly near or at the control area itself, namely ailerons or control flaps of the wings, resulting in a detrimental effect. This is shown in Fig. 3.

(*a*) Is the top view of the wing with ordinary aileron flap.

(*b*) Is the Nazir Trail flap.

It will be seen that the tip stalling has encroached upon the wing, occupying the control area (ailerons) in the



The Nazir cut slot and trailing flap control. Many appear to be under the mistaken impression that the trailing portion of the wing is hinged. This is not so, the only movable parts being the trailing flap and the shutter which opens and closes the slot.

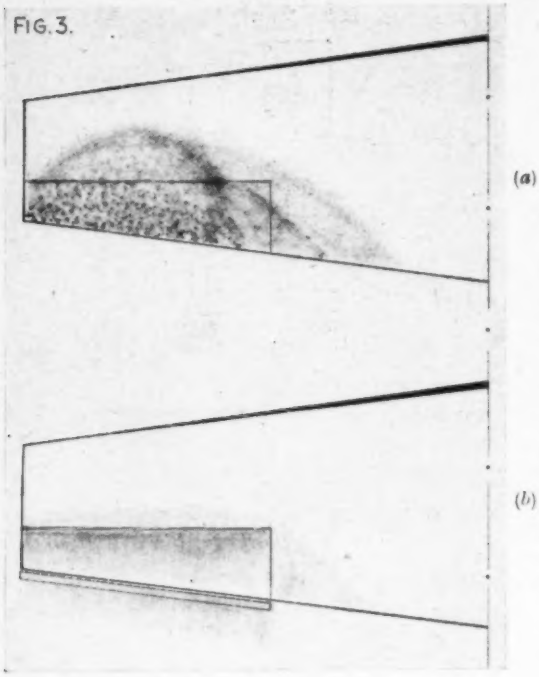


Fig. 3.—Showing difference in burbling on a tapered wing with (a) ordinary aileron and (b) Nazir cut slot and trailing flap.

case of wing (*a*); Wing (*b*) shows the downwash effect of the cut slot and flap upon the control area, where the air from underneath the cut slot is seen flowing past the trailing part of the wing—including the flap at the back. The two types of stalls, namely, the chordwise and spanwise, are also seen in Fig. 3(*a*). The trailing edge stall is seen remedied upon wing (*b*).

There have been suggestions as to incidence variation at tips, and aerodynamic washouts, to remedy the early stall. This would in turn involve the designer in another problem of stressing for twist, etc. There is yet another suggestion for a front slot coming into action early, at small incidences; however the air from underneath the slot is likely to disturb the smooth stream over the leading edge at small angles.

My experiments suggest that the tip stalls set in from the back of the wing, and therefore it is better to remedy them from the *rear* than from the front, and the cut slot appears to supply a powerful circulation flow, just where required, to counteract the burbling without obstructing the smooth stream in *front*. When this remedy takes place in my experiments, a notable phenomenon seems to occur on the tapered wing, viz.: the changing of the violent tip stall into a delayed intermediate or spread stall, which does not appear to be as detrimental and rapid as the tip stall. By so changing the stalling aspect of the control, the original burbling is much delayed, giving the advantage of a smoother air stream over the upper surface up to larger incidences. This effect is still further increased by the provision of a flap at the extreme trailing edge of the wing, which acts as a servo flap or feeder, considerably advancing the circulation over the entire trailing wing, including the control area. In fact the turbulence at the rear is fully remedied by the cut slot and flap which is described later.

Sucking Away the Boundary Layer

Among the many ways of increasing powerful lift circulation over aerofoils sucking away the boundary layer of the upper surface of the wing seems to be the most promising. Unfortunately, however, the problem of mechanical complications is connected with it. Dr. Lachmann gives some reference in his recent paper on tapered wings.* According to him, if this were achieved practically, with some simple mechanism it would open out possibilities of obtaining very great lifts from aerofoils. There seem to be two methods of doing this:—

The first is by sucking the layer from inside or underneath the wing, and dispelling it through an extra outlet at some suitable place, probably at the back. The second method is by drawing or thinning away the layer from the very back of the wing by creating a powerful suction at the extreme trailing edge, without having any extra outlet units for dispelling the exhausted air. Some experiments carried out in the United States are said to have given remarkable results, and it would be very interesting to study the behaviour of the airflow from the trailing edge of the wing, particularly at large incidences, when the device is in full action. The second method of creating suction behind the wing, by drawing the air from underneath, seems to be much simpler, and it appears to lend itself to the trail cut slot and flap arrangement.

The suction at the back of the flap is so powerful that the "air circuit" round the trailing edge of the wing is unbroken from the very beginning and even up to angles of incidence of 45 deg. (the maximum incidence reached during my experiments). This was shown in Fig. 4. It

(*Continued on page 94c.*)

* The Aerodynamic and Structural Features of Tapered Wings.

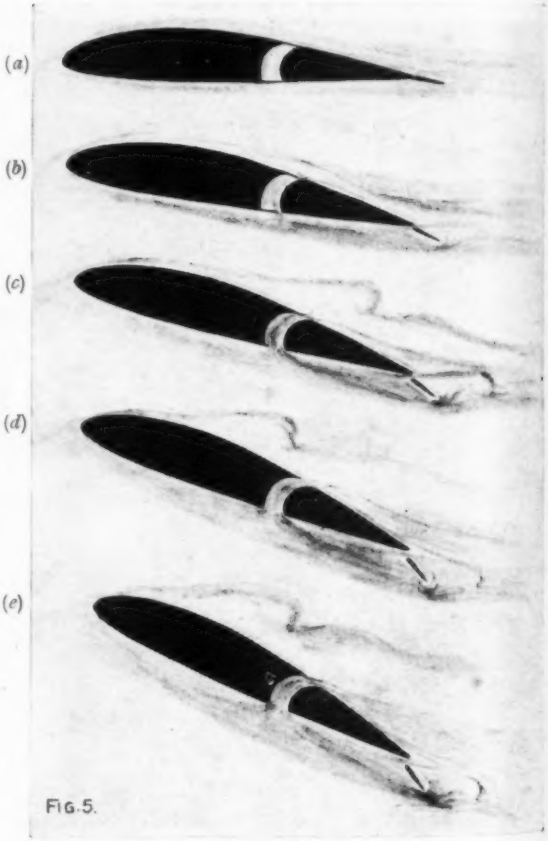


Fig. 5.—Air flow around wing with Nazir cut slot and trailing flap. The angles of incidence are 2, 9, 15, 20 and 25 deg. respectively.

(*Continued from page 94b.*)

will be seen that although the trailing portion of the wing behind the cut slot is at an incidence of 45 deg., as is, of course, the whole wing, the air flow from the cut slot flows around the entire trailing part, owing to the suction at the back of the flap, contrary to the airflow in the case of the slotted flap. (Fig. 4 was published on page 42, December 31, 1936.)

This remarkable phenomenon of an unbroken circuit was also observed even when the wing was at nearly 90 deg. incidence (85 deg. or so).

Discovery of Existence of an "Air Circuit" Round the Wing

During my experiments with cut slots and flaps, some remarkable observations were made, particularly in connection with the trail flap. It was observed that the trail flap created enough suction to draw the air not only from underneath its own leading edge, but also from a distance of between five and six times its own chord away from its leading edge. This phenomenon occurred over a wide range of incidence, even when the main wing was at an angle of 45 deg. (see Fig. 4). It has already been seen that turbulence could exist outside the airflow circuit which formed round the aerofoil without producing much interference, but that no sooner did the turbulence encroach upon the circuit path than the latter was broken, with detrimental results. It would thus seem that the airflow resulting from the operation of the trail flap completes a closed circuit over the entire trailing wing, starting from underneath the flap, via the cut slot, and returning behind to the flap again.

The position of the cut slot in relation to the chord and the flap, together with its incidence, is of great importance in obtaining the highest efficiency, and in fact is critical. Fig. 5 shows a sketch from the records of airflow observations. It will be observed that there is a smooth airflow over the entire aerofoil at an angle of 2 deg. (*a*). The flow behind the flap in its first position is in the form of a downwash, the cut slot being in the closed position. Fig. 5 (*b*) shows the second movement of the flap at a main wing incidence of 9 deg., when the cut slot is just beginning to open and counteracts the formation of eddies on the trailing part. The flow over the upper surface of the wing at the rear is on the verge of breaking away, but the suction behind the flap tends to draw it downwards, on to the wing, thus delaying the separation.

It is after this stage that as soon as the upper stream is broken burbling sets in on the rear part of the wing, stalling the aerofoil a few degrees later, in the case of the ordinary landing flap without a slot. Fig. 5 (*c*) represents a main incidence of 15 deg. and the flap is one-third down, bringing the cut slot into full action. The upper air stream is already separated from the aerofoil, and the flow through the cut slot flows widely over the whole of the trailing part, including the control area, with greater velocity. Fig. 5 (*d*) shows the aerofoil after the stall at an angle of 20 deg. when the flow at the leading edge is becoming more and more disturbed. It is interesting to note the flow at the trailing edge of the wing, which is seen in the form of a more powerful downwash, even after the stall. A notable feature is that although the wing is under the effect of the leading edge stall at an angle of 20 deg., suffering a great loss of lift, the cut slot and flap supplies the trailing part with a powerful lift circulation, in spite of the loss of lift in front of the slot.

A remarkable phenomenon is the change in direction of the dead air in flowing through the slot to the upper surface of the wing. This is clearly shown in Fig. 5 (*e*) (wing at 25 deg. incidence) where the dead air is seen reversing underneath the wing before going to the slot, to flow past the trailing edge above and behind the flap (aileron).

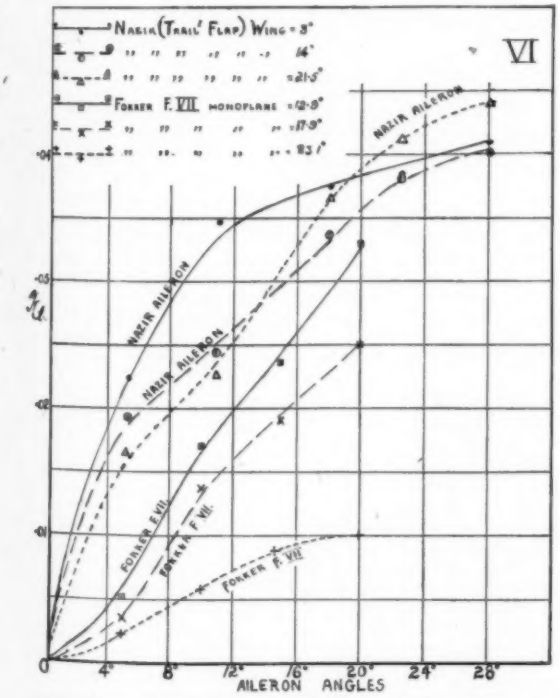
Tests of Control Under Practical Conditions of Operation

As it was necessary to test the device in the manner required for the actual use of controls in the air at various incidences, several experiments were carried out to substantiate this. Various aileron movements were tested for full rolling moment of both ailerons at three main wing incidences—namely at 3 deg., 14 deg. and 21½ deg. Both ailerons were used in conjunction with the cut slot, and the opening of the slot was synchronised with the aileron movements. Some unusual results were obtained with greater aileron deflections, at large incidences. The following table gives the synchronising data of the combination.

SLOT SYNCHRONISATION DATA WITH THE FLAP ARRANGEMENT

Aileron Positions ...	First 5½°	Second 11°	Third 18°	Fourth 21½°	Fifth 28°
Lift Aileron ...	Slot Sealed	Slot Beginning to Open	Slot Half Open	Slot Open Wider	Slot Fully Opened
Drag Aileron ...	Slot Sealed for all Positions.				

Graph No. VI shows a comparison of aileron deflection against Kl due to both ailerons, with the Fokker F VII monoplane* at various main wing incidences. It will be seen that the rolling control decreases with increased incidence of the main wing in the case of the Fokker F VII monoplane, whereas my device shows an unusual increase in the rolling control with increased incidence. My curve of 21½ deg. main wing incidence indicates an increase of about 8 per cent. compared with the 3 deg. main wing incidence curve, at an aileron deflection of 28 deg., whereas the Fokker F VII monoplane curve, at 23 deg. main wing incidence shows a decrease of about 70 per cent., even with the flap deflection of 20 deg., compared with that of 13 deg main wing incidence curve.



Comparison of rolling moments due to both ailerons on Fokker F.VII monoplane (see R. & M. No. 1059).

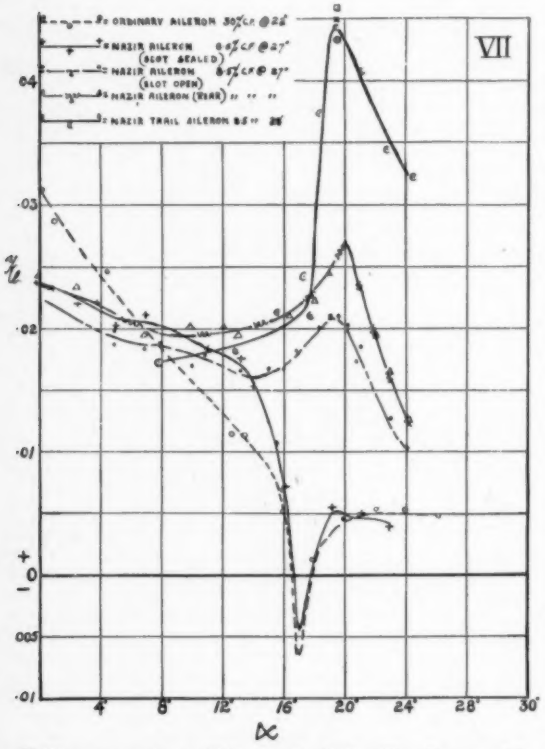
* See R. and M. 1059 Fig. 7.

Rolling Moment Test on Tapered Wings

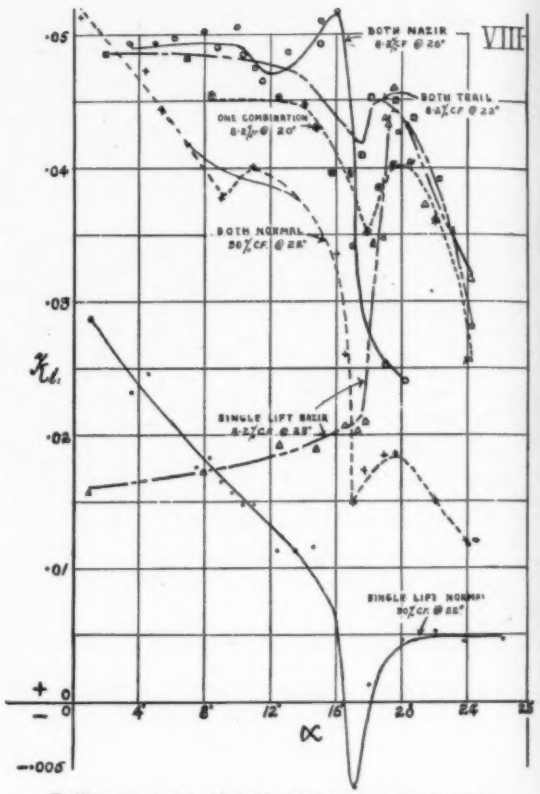
It was necessary to test ordinary flaps as ailerons for the purpose of comparison on the tapered wing, together with the effects of opening and sealing the cut slot as well. All my experiments appear to show the tip-stalling phenomenon on the tapered wing, even at small angles of incidence such as 3½ deg., 9 deg. and then finally at 15 deg. incidence. Various arrangements were tested and a considerable increase of lift was found with all of them. The results have been plotted in graph No. VII. The ordinary aileron curve indicates a continuous decrease in the rolling moment from the very beginning, and at 15 deg. it starts dropping so steeply that the control is reversed at 17 deg. The ordinary slot-sealed/flap curve, although it shows an increase in rolling moment from 5 deg. to 16 deg. owing to the flap effect, nevertheless stalls in a similar manner, and at 17 deg. there is also a reversal of control. This curve indicates a slightly earlier stall at 14 deg. owing to the flap effect. The effect of slot opening under identical conditions is indicated by the unusual upward peak in the curve from 14 deg., delaying the stall of the wing to 20 deg. It will be seen that there is an increase of about 75 per cent. at 19 deg. incidence compared with the slot-sealed curve with flap down, and it is double that of the ordinary curve at 24 deg. As the flap was moved to the rear, the effect increased still further, which is shown by the Nazir rear flap curve. The effect of the trail flap is most interesting; there is even a still further increase in lift after the stall.

Full Rolling Moment Comparison of Both Ailerons on Tapered Wing

Graph No. VIII shows rolling moments of both ailerons of various combinations. It will be seen that the trail flap curve shows a general increase of about 37 per cent.



Rolling moment coefficients of single lift ailerons. Tip chord 0.5 of centre chord; V = 44 ft/sec.; R = 116,000



Rolling moments of both ailerons on tapered wing.

at small angles up to 16 deg. and more than double at 20 deg. Although there is a drop in the curve, it is still doubled at 24 deg. incidence, compared with the same curve. The upward peak of the single lift aileron curve is more interesting; it indicates the rolling moment due to the lift aileron after the normal stall of the wing. The amount of rolling moment due to drag aileron is also clearly seen. There is an increase of about *eight times* for the Nazir curve of 22 deg. incidence compared with the single lift ordinary aileron flap. The maximum rolling moment at 16 deg. is shown by the sliding type curve which indicates a steep stall at 18 deg. The one combination curve does not show as great rolling moment as the trail flap curve.

Comparison of Air Flow Round the Slotted and Nazir Flaps

Fig. 6 shows airflow around two flaps, namely: the slotted flap and the Nazir flap at incidences of 12 deg. and 20 deg.

Figs. (*a*) and (*b*) show both wings at an angle of 12 deg. with their respective flap deflections. Figs. (*c*) and (*d*) are at 20 deg. incidence with greater flap movements on each wing. It will be clearly seen how disturbed is the region behind the slotted flap, compared with that behind Fig. 6 (*b*). In the case of Fig. 6 (*a*), when the flap is deflected at the required angle the top profile of the wing is considerably broken, resulting in the formation of eddies owing to an unsupported flow of air at the rear. In the case of Fig. 6 (*b*) (the Nazir flap) it will be seen that for equal wing incidence the original airflow path along the top profile of the wing is unaltered (because of the trailing portion being fixed with the whole wing). Consequently the wing is in much closer touch with the air stream than

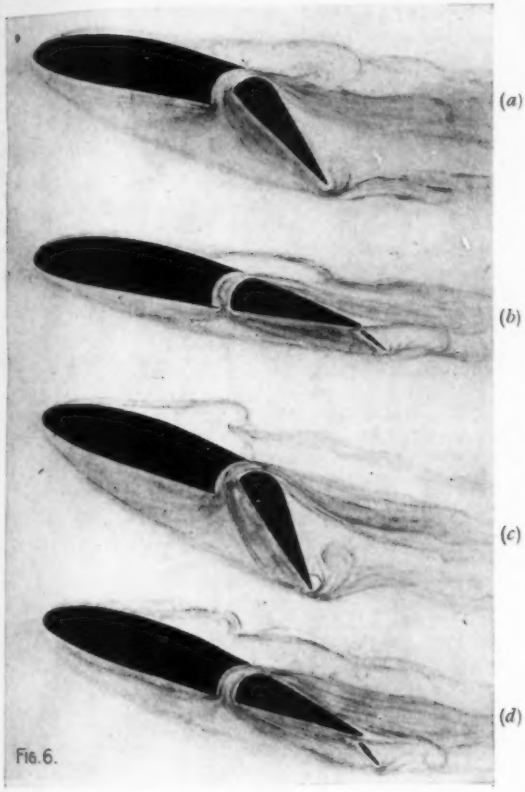


Fig. 6.—Comparison of air flows around (a) slotted flap at 12 deg. ; (b) the Nazir flap at 12 deg. ; (c) slotted flap at 20 deg. ; and (d) Nazir flap at 20 deg.

the wing with slotted flap. Again the breaking ot the original surface, necessary in the case of the slotted flap, appears to advance burbling in front, because the air is thereby dropped more quickly and forms eddies, whereas by keeping the whole of the top wing profile *constant* it has been found that the burbling is delayed until a larger angle of incidence is reached.

The smooth air through the slot in Fig. 6 (*a*) appears to flow round the nose of the flap only (the leading edge of the slotted flap) and if optimum lift on the flap was required, the air would have to take a sharp bend, to flow round the whole of the flap (which could only be possible by sucking the flow from behind), to prevent the flap from stalling

The air through the cut slot in Fig. 6 (*d*) flows smoothly over the *entire rear wing*, giving a more powerful effect even when the front part of the wing is stalled. Consequently the slotted flap begins to stall itself much quicker when moved away from the air stream than the cut-slot arrangement.

The Family of Stalls

There appear to be *five* types of stalls occurring upon wings of aeroplanes, three of which occur in a direction along the span, the remaining two being in direction along the chord. The former are :—

(1) The central stall, which is formed upon the rectangular wings.
(2) The tip stall, which develops upon tapered wings.
(3) The intermediate stall, which takes place on moderately tapered wings.

The spanwise stalls take place both on rectangular and tapered wings. The remaining two classes of stall occur upon aerofoils either simultaneously or separately, in relation to the chord of the wing, namely :—

(4) The leading edge stall.
(5) The trailing edge stall.

Each of these stalls has different effects upon the aerodynamic efficiency of wings. The first three types might well be classed according to the location along the span, as spanwise stalls, and the second type according to the direction along the chord, as chordwise stalls. The two families of stalls are roughly indicated in Fig. 7. On some wings they form simultaneously and quickly join together to form the second stall ; on others they spread out rapidly, from one particular point, in the form of an elongated fan. The former appears to occur more generally with tapered wings, as indicated in the figure. It will be seen that both types of stall occur upon tapered wings, and quickly mingle together. This phenomenon of burbling entanglement seems to be very critical and rapid. The chordwise stall, which occupies a greater frontal area of the wing, appears to form eddies even quicker than the spanwise stall. The chordwise stall then seems to draw the spanwise disturbance which consequently occupies a greater area, resulting in the first major loss of lift. This amalgamation of turbulence appears to be greatly responsible for the earlier stalling of tapered than of rectangular wings. So far as I understand, this has some relation to the ideas on which Mr. Irwin and Mr. Gray are working.

Remedying the Type of Stall

It will be seen that both these types are detrimental to the wing, considerably decreasing the aerodynamic efficiency. It is, however, possible that the effect of one family may vary according to the remedy at suitable periods. My experiments indicate a limit of certain incidences within which these remedies could be called upon to counteract the disturbance ; otherwise the effect appears to be *reversed*, resulting in a loss of lift. For instance, the very beginning of the chordwise disturbance or burbling may first occur at say 6 deg.–8 deg. wind tunnel. (8 deg.–10 deg. incidence at full scale) from the rear of the top surface, and might rapidly spread over a large area (particularly upon the tapered wing) if not checked or prevented in time.

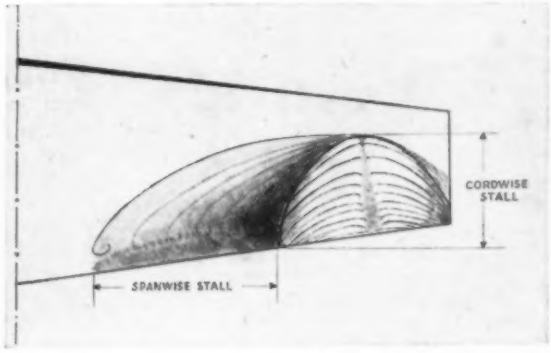
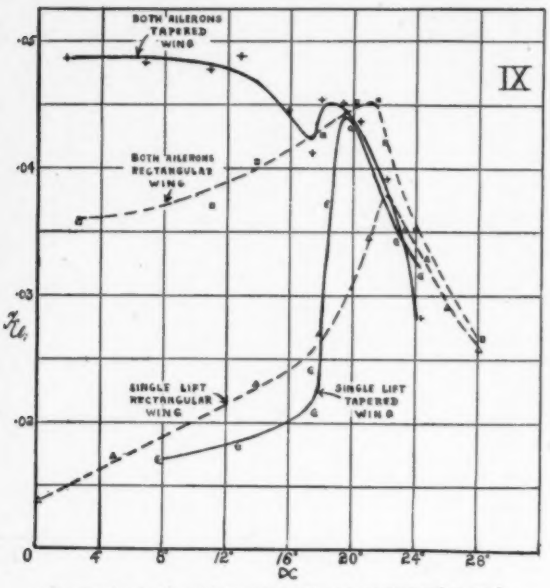


Fig. 7 illustrates the two classes of stall on a tapered wing joining together to form the second stall.

Application of some form of remedy is therefore necessary at the *rear* where this formation of eddies first takes place (on the upper surface of the wing), to prevent the very formation of burbling at small angles. If this turbulence is allowed to spread over a certain percentage of wing chord, it consequently develops rapidly into the second stall, as shown in Fig. 7, resulting in a greater loss of lift. It is at this stage of severe stall that the wing actually



Comparison of rolling moments on rectangular and tapered wings.

drops after giving the first maximum lift. The well-known front slot is now called into play at incidences near the stall to diminish this increased turbulence at the rear from the leading edge, which has already developed into the second stall.

The fact is that the burbling at the rear is merely postponed a few degrees by the front slot, and not remedied. Also the effect of the airstream in having the flow from the leading edge to the control area (in travelling the distance along the chord) is thereby diminished. The cut slot in my experiments appears to prevent the very beginning of this turbulence from small incidences onward, and, the distance to be covered by the air stream being comparatively less, the effect is more powerful.

Rolling moments of both rectangular and tapered wings have been plotted in graph No. IX (both trail flap arrangements). It will be seen that the full rolling moment of the tapered wing is greater up to about 18 deg. than the rectangular wing, after which it falls off in almost an identical manner. The single lift rolling moment of the tapered wing is very interesting, however, compared with that of the rectangular wing. The increase due to the lift aileron is greater for the tapered wing than for the rectangular wing at 20 deg. incidence.

Both curves, however, show almost equal rolling moment after the stall, although the tapered wing (under normal conditions) is subjected to the early tip stall. The curves clearly show the improvement on tapered wing resulting from my cut slot and flap combination, although the stalling characteristics of the rectangular wing are indicated by a slightly delayed incidence.

In conclusion, the following summary sets out the principal advantages of the cut slot and flap combination as compared with existing control devices :—

(1) It is possible to obtain high lifts at both small and large incidences by means of this combination.

(2) Tapered wings of high taper ratios may be safely employed without danger of a tip stall, as this combination changes the character of the stall from a violent tip stall into a (comparatively harmless) delayed-spread stall, giving a larger incidence range to the control surface.

(3) The combination of cut slot and flap prevents the forming of the trailing edge stall, which is thus completely eliminated, even up to an angle of 40 deg. ; although the leading edge stall still occurs upon the wing (at larger incidences).

(4) The combination makes the lift aileron, at large incidences, even more powerful than the drag aileron, resulting in a great increase in rolling moment.

(5) The combination of cut slot and flap constitutes one single system of control, operative and effective at all speeds. It is well known that slots alone reduce lift at small angles of incidence and thus are only effective at the larger angles ; on the other hand, flaps, by themselves, are effective at small incidences only.

(6) The combination, whilst increasing the stalling angle of the wing, at the same time maintains high lift ; it is thus useful both for lateral control and slow landing (with a considerable margin of safety) at angles beyond the stall.

(7) The combination could safely be fitted to tail planes if required.

(8) The device appears to combine the separate advantages of the slot and flap, while eliminating the disadvantages of either when used individually.

(9) It is possible that the cut slot may suitably balance the travel of centre of pressure set up by the flap.

(10) My combination makes it possible to use small areas of flaps on wings.

(11) The cut slot and flap, by a servo action, greatly increase the efficiency of the whole of the neighbouring trailing part behind the slot, giving a powerful lift circulation over the aileron. This indeed is claimed as the outstanding merit of the cut slot and flap combination.

No correction has been attempted for Reynolds Number.

TECHNICAL LITERATURE

SUMMARIES OF A.R.C. REPORTS

REPORTS published by His Majesty's Stationery Office, London, which may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester, 1; St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through booksellers.

WIND TUNNEL TESTS OF THE CHARACTERISTICS OF WING FLAPS AND THEIR WAKES. By K. W. Clark, B.Sc., D.I.C., and F. W. Kirkby. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1698. (26 pages and 16 diagrams.) August 31, 1935. Price 3s. 6d. net.

The purpose of this preliminary investigation was to find whether flaps of different types giving the same lift and drag would also produce the same pitching moment, and wakes of equal intensity and position. It seemed possible, for instance, that two flaps with equal drag might differ appreciably in the height of the wake. Such points may be of importance if tail troubles are found when flaps are used.

The types of flap which were tested on the aerofoil model of R.A.F 44 section were as follows :—(*a*) plain flap (10 per cent. and 20 per cent. chord) ; (*b*) 20 per cent. plain flap with leading edge wing slot ; (*c*) Handley Page type slotted flap 20 per cent. chord ; (*d*) as (*c*) with 7½ per cent. chord split flap attached to the lower surface of the slotted flap as patented by Joseph Ksoll ; (*e*) split flap—Schrenk type 10 per cent. and 20 per cent. chord flaps ; (*f*) split flap—Zap type 10 per cent. 20 per cent., and 30 per cent. chord flaps.

The following are the authors' conclusions :—

(1) If a flap of 10 per cent. of the wing chord is used there is little to choose between the plain and split flaps as regards lift and profile drag. But, as the flap size increases the Zap flap gives the higher lift coefficient and the Schrenk and Zap flaps have larger profile drags than the other types.

(2) The Handley Page slotted flap has a low drag which will be useful for take-off and two methods of increasing the drag for landing were tested, (*a*) pulling the flap down beyond the optimum angle for lift, and (*b*) splitting the rear end of the flap which increases the maximum lift, but involves a second control.

(3) The pitching moment of a Zap flap is larger than that of a corresponding Schrenk type.

(4) The disturbed region near the tail is considerably wider than the wake in which there is loss of total head. The disturbed region with flaps down extends to about the same height as with flaps neutral, since the wake, though wider, is powered.

(5) Rapid variations in downwash were found in traversing the wake behind the large split flaps.

THE MAYBURY REPORT

Long-awaited Recommendations Published : "Rationalisation" of Internal Air Routes, with a Central Junction in Lancashire : Licence for Single Operating Company or Combine : Government to Provide Radio and Meteorological Services : Encouragement for Private Flying

Brigadier-General Sir Henry P. Maybury, Chairman of the Committee.

THE long-awaited Maybury Committee's Report on the Development of Civil Aviation was published last week, unfortunately too late to be of much use in connection with the Airports Conference. The summary of the conclusions and recommendations of the Committee is published in full below, and is followed by amplifying notes on the more important aspects. Comment appears in a leading article on pages 83 and 84.

The Committee was formed in July, 1935, under the following terms of reference:

> "To consider and report upon measures which might be adopted by His Majesty's Government or by Local Authorities for assisting in the promotion of civil aviation in the United Kingdom and their probable cost. The Committee will take into account the requirements of the Post Office for air mails and the relation between aviation and other forms of transport."

Members of the Committee were: Brigadier-General Sir Henry P. Maybury, G.B.E., K.C.M.G., C.B., M.Inst.C.E. (Chairman); Col. Sir Donald Banks, K.C.B., D.S.O., M.C.; Mr. J. A. N. Barlow, C.B., C.B.E.; Sir Cyril Hurcomb, K.B.E., C.B.; Sir Arthur Robinson, G.C.B., C.B.E.; and Lt. Col. Sir Francis Shelmerdine, C.I.E., O.B.E.

The Committee's summary of conclusions is as follows:—

The Summary

(A.) We think that local authorities should make every endeavour to encourage private flying and we recommend that due weight should be given in reviewing the future subsidy arrangements for flying clubs to the valuable work which they have done in the past.

(B.) We think that encouragement should be given to flying displays designed to bring home the practical applications of flying and that aerodromes should be made centres of attraction. We recommend that aerodrome owners should endeavour to popularise flying by the encouragement of short pleasure flights, wherever practicable.

(C.) We think that increased publicity for special charter services might be advantageous.

(D.) We believe internal air services can be made to pay under suitable conditions. To achieve this end it will be necessary to apply restrictions to avoid undue competition. We recommend accordingly that the following routes should be regulated:—

Belfast to Manchester or Liverpool.
Glasgow-Edinburgh to Manchester or Liverpool.
Newcastle to Manchester or Liverpool.
London to Manchester or Liverpool.
Portsmouth-Southampton to Manchester or Liverpool.
Bristol to Manchester or Liverpool.

and that this regulation should provide, if possible, for the co-ordination of flying over these routes.

(E.) We recommend that an exclusive licence should be given for a period of five years to a single company or to a combination of companies working on the closest terms of co-ordination to operate these routes, and that a licensing authority should be appointed to select the licensee or licensees.

(F.) We think that this authority should also be charged with the licensing of all regular internal air passenger services.

(G.) We recommend that freedom of flight for aircraft without radio should be maintained as far as possible, but that certain height layers and zones should be reserved for radio-controlled aircraft.

(H.) We recommend that all radio facilities, a meteorological organisation and a comprehensive air traffic control organisation adequate to secure the safety and regularity of air communications should be provided, maintained and operated by the Government, and that in present circumstances no expense connected with this service should fall upon aerodrome proprietors. We think that in due course it should be possible to recover these costs from aviation itself through the medium of registration fees or otherwise.

(I.) We recommend that aerodrome proprietors should be responsible for providing the necessary equipment, other than radio, to enable their aerodromes to be used in safety under all conditions of visibility.

(J.) We think that while the private ownership of public aerodromes should not be prohibited it is desirable that they should generally be in the ownership of local authorities or statutory bodies.

(K.) We recommend that there should be standard scales of aerodrome charges in operation throughout the country.

(L.) We recommend that the local authorities in all the larger towns and centres of population should take early steps to see that a suitable site for a standard aerodrome is secured for their citizens, and we draw attention to the desirability of provision being made for aerodromes in other localities.

(M.) We point out in particular the urgent need for the provision of a fully equipped standard size aerodrome in Scotland to serve Edinburgh and Glasgow, and the desirability of further development at Belfast, Bristol, Manchester, Newcastle, Portsmouth and Southampton.

(N.) We think that as soon as the necessary ground organisation is completed, night mail services between London and Glasgow-Edinburgh, and London and Belfast should be instituted, thus affording a valuable improvement in postal facilities. At a subsequent stage we think that further night mail services should be considered.

(O.) We recommend that financial assistance for a limited period should be given to a suitable flying school so that it can offer advanced training for air line pilots at low rates, preference being given to Short-Service pilots who have retired from the Royal Air Force. We think also that consideration should be given to the question of continuing similar arrangements on a permanent basis for Short-Service pilots of the Royal Air Force.

(P.) We recommend that pilots of companies engaged in air transportation should be subject to special tests of skill.

(Q.) We recommend that consideration be given to the desirability of modifying the present practice of inspection to meet better the requirements of air line operators.

Some Notes on the Recommendations

Clauses A, B and C of the summary of the conclusions arrived at by the Maybury Committee do not call for any particular comment. One may or may not agree with them, but they are of relatively small importance in comparison with the main theme of internal air services.

In arriving at the conclusions set out in D, the Committee was guided by considerations stated elsewhere in the Report. For instance it is pointed out that it is a prerequisite that cut-throat competition must be eliminated. It is thought that the routes selected would ensure suitable conditions for experimental operation of air services in such a way that they would be given the maximum opportunity to become self-supporting and thus supply that background of confidence which is at present lacking.

On the sketch map opposite are set out two alternative sets of routes on the lines suggested by the Committee. The dotted lines on this map show a set of routes linking up various important business and industrial centres, and giving a total mileage of 2,900 miles. The alternative system of routes, and the one recommended by the Committee, is shown on the map in full black lines. The object of this arrangement of routes is to shorten the total route mileage. By the system of having a junction aerodrome at Liverpool or Manchester, or at some aerodrome between these two, the total route mileage is reduced to about 960 miles. The Committee considers that this arrangement should produce high load factors, i.e., the carriage by the aircraft of nearly their full pay load on every flight, because an aircraft flying to the junction on any route might carry loads destined for three areas, and on its return trip might carry loads from these areas.

It is considered that on such a route system as that shown in full lines on the map, a schedule of four round trips per day over the system would require sixty aircraft, all 14-seaters of one type, and each machine flying some 1,500 hours per year. The Committee considers that the junction aerodrome system is the scheme which is best calculated to secure the greatest measure of advantage and recommends that it should be given an experimental trial for five years.

Clause E requires little explanation beyond pointing out that it is recommended by the Committee that this licence should be limited in the first instance to a term of five years, renewable thereafter for suitable periods if satisfactory performance has been given.

In connection with clause H, it is explained that the probability is that for some time, at any rate, there would be no direct source of revenue to cover the cost and that the necessary finances at the outset would require to be furnished by the Government. The Committee estimates that the cost of carrying out these recommendations is expected to be about £320,000, and the total annual cost about £240,000, of which about £40,000 per annum is already being incurred or in prospect. The whole cost of the meteorological service is, of course, already borne by the Government. The Committee has deliberately selected this suggestion of making a substantial additional contribution to the development of aviation by the State. It prefers this method to that of a subsidy.

On the subject of airports, the Committee points out that there is urgent need for provision of adequate standard size aerodromes at the central and terminal points indicated on the map. It is pointed out that Speke aerodrome, Liverpool, is already large enough and it appears probable that the new Ringway aerodrome, Manchester, can be suitably developed. Both Bristol and Newcastle aerodromes, the report states, can be readily extended, and it is understood that the Belfast Harbour Commissioners are rapidly developing the aerodrome adjoining Belfast. Extension and improvements are needed at Southampton and Portsmouth. The Committee particularly calls attention to the urgent necessity for the provision of a suitable aerodrome in Scotland to serve Edinburgh and Glasgow.

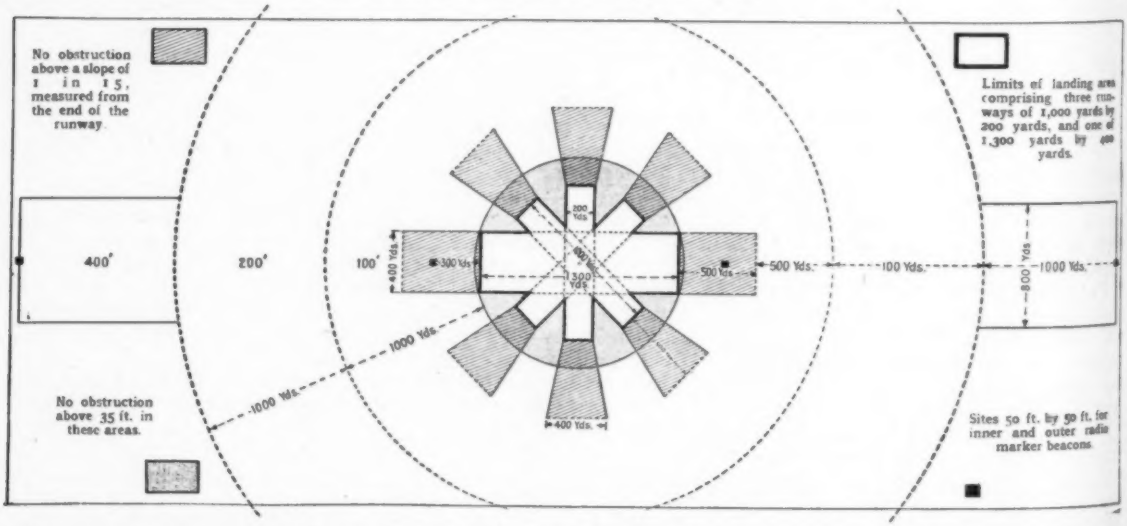

No obstruction above a slope of 1 in 15, measured from the end of the runway
Limits of landing area comprising three runways of 1,000 yards by 200 yards, and one of 1,300 yards by 400 yards.
400°
200°
100°
400 Yds.
300 Yds.
100 Yds.
200 Yds.
300 Yds.
500 Yds.
500 Yds.
100 Yds.
1000 Yds.
800 Yds.
1000 Yds.
1000 Yds.
400 Yds.
No obstruction above 35 ft. in these areas.
Sites 50 ft. by 50 ft. for inner and outer radio marker beacons.

Diagram of "standard" all-weather commercial aerodrome. The areas marked 100 ft., 200 ft. and 400 ft. indicate that there must be no obstructions above those heights. The datum from which heights are measured is the mean level of the landing area. Wherever two different height restriction zones overlap the permissible height shall be the the lower of the two.

London is considered to present a special problem, and the Committee points out that it understands that the Corporation of the City of London will purchase the site at Ilford. Road access to this site is stated to be good, and the Committee is assured that new facilities now being provided in this district by the London Passenger Transport Board will give speedy means of tube travel to the City.

It is of interest to record that the Report states that an aerodrome site has recently been approved at Slough, and that there is also a proposal to construct a commercial aerodrome on the north-west of London.

The Report points out that if the various London aerodrome schemes mature there will be seven aerodromes serving London. Owing to the technical restrictions at present governing the siting of standard aerodromes and the necessity for fast surface communications, it appears to the Committee that the area to the north of London is the only one in which a further site could be located. Whatever the requirements of the future may be, it seems to the Committee prudent to ensure against the possibility of the Greater London area, with its population of ten million, being deprived of adequate facilities for air transport. The Committee recommends that steps should be taken forthwith to discover and secure a suitable site for a standard aerodrome to the north of London.

Roof Aerodromes

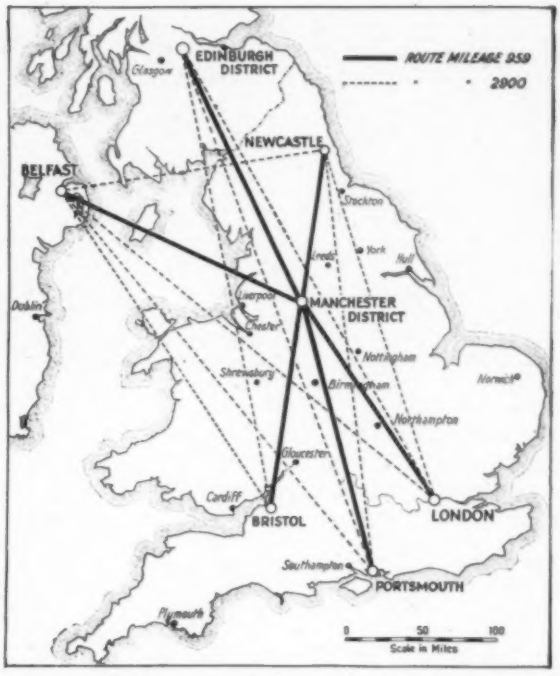
No single central aerodrome, the Report points out, can handle the whole of London's air traffic, while the dimensions of a standard aerodrome which are necessary for safety are such as to make the suggestion of roof aerodromes unattractive for types of aircraft at present in use. The Committee decided that there appears to be no alternative but to develop the main aerodrome on suitable sites in a belt around London. The Committee has considered the proposal for unified ownership for all aerodromes serving London, but the advantages of such a scheme are not apparent at the moment, and it is too early to make recommendation on this point.

The Committee's recommendation under Clause N requires a certain amount of amplification. It is pointed out that the organisation of air services connecting with the present system of travelling post offices, which form the framework of the main postal services, is beset with certain practical difficulties. The Committee has consulted the Post Office authorities and has been provided with certain information concerning the direction in which the night flying facilities which would be provided on the junction aerodrome system could best be utilised to secure acceleration of postal traffic. The following table of times is of interest in this connection, as are also the figures for daily approximate weight of mails now being carried by surface transport.

	Depart.	Arrive.	Daily Approximate Weight (lb.).
1. London-Belfast	8.15 p.m. 11.0 p.m.	11.0 p.m. 1.45 a.m.	3,500
2. Belfast-London	11.45 p.m.	2.30 a.m.	1,500
3. London-{Glasgow / Edinburgh} ...	11.15 p.m.	2.0 a.m.	3,000
4. {Glasgow / Edinburgh}-London ...	11.45 p.m.	2.0 a.m.	2,500

According to the Report it will be for future consideration whether further useful postal improvements could be effected by linking up Crewe at night and thus securing connection with the travelling post office system which radiates from that centre. It is not, however, thought that the provision of an aerodrome with the necessary facilities at Crewe could be justified on economic grounds. It is thought that if a start is made experimentally with the night mail services indicated the organisation operating the junction aerodrome service might suitably be entrusted with them.

The recommendations of the Committee concerning pilots include financial assistance for a limited period to enable suitable schools to give advanced training for air-line pilots at low rates and the suggestion is made that pilots of companies engaged in air transport should be subject to rigorous tests of skill and should be required to possess special licences.



How the Maybury "central junction" scheme would simplify communication between Great Britain's principal centres. Note the difference between the route mileage and that of a point-to-point system (light dots) run on existing haphazard lines.

Clause Q: The subject of aircraft maintenance comes in for considerable attention by the Committee. After pointing out that airline operators are faced with the necessity of employing their aircraft for the largest possible number of hours during the year, the Report states that one difficulty in connection with maintenance is occasioned by long periods of immobility to which an aircraft is annually subject at the time of its complete overhaul preparatory to the renewal of its Certificate of Airworthiness. While not desiring to advocate any relaxation of safety, the Committee understands that, as a complete record is kept of all work done on any aircraft at any time, it may be possible from the record to certify that an aircraft has been properly maintained and was in a condition to justify the issue of the necessary certificate. The advantage claimed for this method is that the work of reconditioning can be carried out at periods to fit in most conveniently with the requirements of scheduled services. The Committee states that it is informed that this practice has been adopted with advantage on certain sections of the route flown by Imperial Airways and on the largest air lines in the United States. The Committee therefore recommends that consideration should be given to the desirability of modifying the present practice of inspection so as better to meet the requirements of the airline operators while at the same time securing the airworthiness of all aircraft transporting mail or paying passengers.

A TUTORIAL GATHERING

THE nine-and-a-bit years in which the British Institute of Technology and British Tutorial Institutes have been dispensing knowledge through the medium of the Royal Mail have been punctuated by a series of dinners, the magnitude of which has been progressive with the growth of the business.

This year's function, the ninth, was attended and enjoyed by about three hundred guests, and, as usual, presented an excellent opportunity for learning of the progress made.

Mr. J. J. Cleaver revealed that over a million men and women had sought their guidance on careers. More than 2,500 lessons, he said, were corrected daily.

Responding to "Our Indian Branch," proposed by Mr. R. S. Nehra, Sir Abdul Quadir, a member of the Council of the Secretary of State for India, said that his country presented vast scope for such educational bodies.

In the regrettable absence of Professor A. M. Low, Mr. H. Hum proposed the toast of the chairman, Mr. Graham Maw.

The subsequent revelry was worthy of the occasion.

Topics of the Day

Navigational

FROM time to time the majority of enthusiastic amateur pilots suffer the recurrence of a pernicious malady known as navigitis. They buy another text book and some new calculating instrument which they use largely for the purpose of baffling less discerning friends who are satisfied to travel by earth-bound methods. Usually these fever cases reach the stage of understanding the difference between centesimal and sexagesimal methods of angular measurements, and between cold and warm fronts, and then return to Bradshaw.

The disease, I fear, is permanently with me, and my temperature just now is simply a little higher than usual. It all began long ago when I found that long-distance cross-countries were something of a bore, and when I learnt to amuse myself by working out estimated times of arrival. The fact that I rarely arrived according to the calculated E.T.A. made little difference.

Looking through various possessions the other day I found among them a special ruler, a super protractor, a Gilbert calculating protractor, a Simmonds-Goudime course and distance calculator, and a plain C.D.C.

Now, every one of these things has special and peculiar advantages, but one simply cannot carry them all around together. The ruler draws lines, measures distances, and provides a lot of useful conversion figures; the protractor is necessary for laying off courses; the Gilbert does the same in a better way, and has a built-in proportional calculator; the Goudime works up to 140 m.p.h., is quite accurate, and has a scale down one straight side of the mounting; and the C.D.C. is quick in action, can be used for all sorts of short methods, and has a proportional calculator on the perimeter.

All-in-one

SURELY it is not beyond the wit of man to devise one instrument at a cost, say, of £2 which will do everything? My idea, provisionally unpatented, would have an improved form of C.D.C. as a basis, but the protractor and special measuring cord or tape would necessarily need to be a detachable part, since it is not easy to make a C.D.C. which, at the same time, can be transparent in the centre.

The improvements in the main instrument would consist of multiple squaring (with finer intermediate lines) in the movable dial, a subdivision of the lower end of each scale, and a much less substantial spindle arrangement, so that, with arms reading up to an air speed of 200 m.p.h., it would still be possible to obtain accurate results with low wind velocities.

Probably all this has been, or will be, done in the instruments developed for an Air Force which will shortly be dashing around in 250 m.p.h. machines. Using a very delicate spindle it might be possible, with a transparent area in the centre of both discs, to use the instrument for laying off courses. I have not decided whether the measuring device shall be a tape or an extensible metal rule (with ten- and four-mile scale conversions) swinging around the centre. The latter would be more practical in many ways, but it would make this instrument so terrifying to look at that only first-class navigators would buy it—and they would demand a bubble sextant thrown in.

Necessary Calculations

RETURNING to sanity, however, I do feel that the present calculating instruments could be rationalised with success, and that amateur pilots would be much happier if they made greater use of such instruments. On principle and for practice I work out a course and ground speed, and, subsequently, estimate a time of arrival on nearly every flight, even when visibility is excellent.

Such operations, when they do not demand more than the movement of a few arms and discs, can be both amusing and instructive, particularly when only an hour remains before sunset and there is a strong wind blowing.... If you trust to luck, you will probably need to put down in a field when it is already too dark at ground level for any field to be properly examined. It is better to have one's leg pulled as a calculating crank than to lose one's insurance rebate or, worse, to have one's neck broken.

Before starting out on my very first cross-countries, my instructor insisted on the execution of a number of vector diagrams, and only allowed me to use a C.D.C. when I had been passed as fit and competent. That insistence, and his little way of demanding to see my calculations, nipped in the bud any tendency I might have developed towards Bradshaw-flying. He is now an airline pilot, and his enthusiasm for navigation is put to better use than it was in convincing self-satisfied young idiots that you cannot dash about on a mixture of hops, hope and landmarks.

A few weeks ago his radio equipment broke down with the ceiling almost on the Channel, and he probably wished, for a moment, that he was back with his quarrelling committee, his hopeless pupils, and his aerobatic enthusiasts. Luckily, his operator got things going again while he crept up the coast looking for a place where the cliffs weren't cloud-capped. His passengers probably thought that the sea looked pretty—just as I did once as a passenger in a radio-less machine flying at zero altitude down the coast of Northumberland.

That vector-diagram training always made me look on the C.D.C. as a somewhat rough-and-ready calculator. Last week I drew a host of diagrams and tested them against C.D.C. and Goudime results. In no case did these results vary by more than 3 degrees of course and 3 m.p.h. of ground speed—except in one, where I absentmindedly drew the wind as blowing firmly away from itself. It is not so easy to make that sort of mistake with a calculating instrument.

INDICATOR.

FROM the CLUBS and SCHOOLS

LONDON
CLUB machines flew 55 hr. 10 min. at Hatfield last week. New members are Messrs. A. T. Thomas and D. Tollemache.

REDHILL
Last week's flying totalled 39 hr. 40 min., there being only five flying days.

BENGAL
The Bengal Flying Club put in 10 hr. 50 min. dual and 44 hr. 5 min. solo during the month of December. Mr. R. C. Reynolds has requalified for his Indian "A" licence, while six cross-country flights have been carried out.

SOUTH COAST
In spite of bad weather 20 hours' flying was done on the Club machines last week. It has been very quiet at Shoreham owing to the fact that a large number of the staff and members were down with 'flu.

MIDLAND
For the week ended January 21 the flying times at the Midland Aero Club totalled 9 hours dual and 14 hours solo and passenger, high winds and rain preventing flying on three days. Mr. H. B. Poole has joined as a flying member.

YAPTON
Flying times for January to the 23rd were 39 hr. 20 min.; the month has been a succession of gales and rain. New members are Messrs. H. R. Lasar and A. J. Goldsmith, the latter taking the £15 "A" licence course.

HANWORTH
Extremely bad weather conditions kept flying hours down to a minimum last week, only 19 hr. 40 min. being logged and very little actual instruction done. Mr. C. M. D. Chambers has become an instructor at the Club, and Mr. J. J. H. Hill has now returned after an absence of two weeks. The Club has one new member —Mr. Gilford.

BORDER
Owing to adverse weather conditions recently, flights at the Border Club have been few and far between. Several members, however, have been flying over the lakes and in the vicinity of the Scottish hills. These are snow-clad just now above 1,000 ft. and look very impressive. New members are Mrs. Chambers as a pilot member, and Miss M. Arckless as an associate member.

PORTSMOUTH
The Club flying at Portsmouth for the year 1936 amounted to 1,333 hr. 50 min. Flying time for the week ended January 21 totalled 20 hr. 35 min., instruction being impossible on three days owing to bad weather conditions. A bridge drive held in the club-house on January 20 was a great success, the prizes being presented by the directors of the Portsmouth Aero Club.

CINQUE PORTS
Mr. R. P. Peyton obtained the Club's first "A" licence for 1937. Mr. J. A. M. Reid has successfully undergone his general flying tests at Hendon and now has only his night flight to do before qualifying for his "B." Mr P. M. Bristow has joined the Club to undergo a "B" licence course. The Club has heard that Mr. Alec Drake, one of the founder members and one-time secretary, has accepted the captaincy of the Penang Flying Club. Members are featuring largely in the Monte Carlo Car Rally this year.

BROOKLANDS
The annual general meeting of the Brooklands Aero Club was held at the clubhouse recently. Mr. Percy Bradley was in the chair and conducted the proceedings with his usual good-humoured efficiency. In reviewing the year's work he mentioned that the membership had, in 1936, increased by sixty-five to a total of 790. The general committee, under the chairmanship of Mr. T. O. M. Sopwith, was re-elected *en bloc*.

Bad weather has again brought down the flying time for the past week, this amounting to only fifty hours, of which thirty were dual instruction, fourteen were solo flying, and six were taxi work. New members for the week include Mr. B. Astley, Mr. N. Pope, Mr. W. James and Mr. F. J. Ireland. Mr. Bentley and Mr. Schmidt have gone solo, while Dr Leon Jona has started flying again. Another pupil is Master V. K. Wigram, aged 16½, who, under the instruction of Mr. Bremridge, reached solo efficiency after a week and a half's tuition. Large quantities of steelwork have arrived at the aerodrome and new hangars are beginning to emerge from the ashes of the old. They should be ready by the end of March, at which time the five new Tiger Moths, which are now on order, should be flying.

Capt. Duncan Davis is organising a party from Brooklands and its associate clubs for a month's cruise on the s.s. *Laconia*, which sails on March 17. If any members of other clubs would like to join the party they will be very welcome. There will be a height judging competition next Sunday.

C.A.S.C.
Last week-end members flew 9 hr. 45 min. Mr. J. C. Wade successfully passed his "A" licence tests and Mr. B. D. Partridge has taken his initial flight with the Corps.

SOUTHEND
During the past week flying activities at the Southend Flying Club were brisk and "B" licence pupils have been out on cross-country work. Mr. Tunnicliffe has joined as a new member.

CAMBRIDGE
The flying times at Marshalls' School for the week ending on January 24 totalled 40 hours. Mr. Janes qualified for his Cambridge Air Pilot's Certificate. He completed the blind flying and cross-country tests in gusty weather. Flying was impossible on two days owing to bad weather.

LEEMING
Hours for the week ended January 23 amount to 9 hr. 45 min. The York Corporation are extending their bus service to link up with the aerodrome. This will be a twenty-minute service and will start on January 31. The annual dance is to be held at the Grand Hotel, Harrogate, on February 10, at 8 p.m. Mr. Sherry has joined the Club.

NORFOLK AND NORWICH
During the past year no fewer than twenty-eight "A" licences were secured by members of the Norfolk and Norwich Club, a ground engineer's licence was obtaind by one of the staff, and two instructors' licences granted. Nearly four thousand flights were made and the total number of hours reached 1,463, which represents an increase of nearly three hundred hours over the previous year.

NEWCASTLE
During the week ending January 16 a total of 33 hr. 35 min. was logged in spite of very poor weather. Mr. H. Trobe has gone solo, while Mrs M. King-Farlow and Mr. T. James have completed their "A" licence tests. The night lighting equipment is now in operation, and recently several members availed themselves of the opportunity of trying it out, when a total of seven hours instructional night flying was carried out.

HESTON
Five first solos in twelve days is good going for January—a month when depressions come from Iceland and pupils go to Switzerland with alarming frequency. The five who have stayed at home (or at Heston) and made good in the air are Miss R. E. Berger, Mr. L. Graham-Wigan, Mr. D. de C. Smiley, Mr. D. Banmeyer and Major H. Sherwood. Mr. Graham-Wigan, who made a quick job of it with only 4 hr. 35 min. dual on the Old Etonian Flying Club Moth, is the secretary of this Club.

HERTS AND ESSEX
During December the Club flew 210 hr. 23 min., the total for the fortnight ended January 14 being 78 hr. 48 min. New members are Messrs. S. J. Bryer and J. G. Martin, while Mr. S. G. Powell has completed his "A" licence tests. After overhaul and C. of A. "—EX" has emerged from the shops and is again in service. Three more members have recently become private owners and, with the housing of their machines, there are now no available lock-ups, so a further six are to be erected.

The Cinque Ports Party

ORIGINALLY planned for February 5, the Cinque Ports Flying Club dinner and dance is, after all, to be held on March 12.

Ipswich Renaissance

FOR the past six months or more the new Ipswich Aero Club has been progressing with due modesty, and an idea of the local potentialities may be obtained from the fact that some two hundred guests attended its first big social function last Friday.

This consisted of a supper-dance, organised with the help of Mr. Cotton's very excellent band and held at the Felix Hotel, Felixstowe. Mr. Whitney Straight, whose company sponsors the club and manages the Ipswich airport, flew over in Miles Straight Special Number One from the demonstration at Heston. On the following morning those few members who were able to force themselves into action had a chance of looking at this new type—one of which will eventually be used by the club—before Mr. Straight took it across to Fen Ditton, Cambridge.

For the moment the Ipswich Club is carrying on quite happily in a small way, but in due course new buildings will be erected and the club facilities will expand to cope with the increasing interest evinced by the average person.

FEASTING the DELEGATES

AS might be expected, the speeches at the Aerodrome Owners Association dinner was studded with allusions, kind and otherwise, to the Maybury Committee's Report. The majority of the persons intimately connected with airport development were present at this dinner, which was held on Wednesday of last week at Grosvenor House, and one might have expected a few minor fireworks; however, only squibs were ignited—a fact which was probably explained by the excellence of the dinner.

In proposing the toast of the Association, Sir Francis Shelmerdine made it quite clear that the Report's findings must not be considered as the final scheme, but as a basis for development. As far as the Air Ministry was concerned, the scheme would cost a matter of £300,000 in capital outlay and some £250,000 annually. Until air services were rationalised municipalities could not expect a return on their capital outlay, and until they could see the possibilities of such a return they could hardly be blamed for failing to show real enthusiasm.

Replying, Mr. Ashley Hall spoke of the value of the accumulated experience of aerodrome owners, and explained how the idea had originated at the historical Mansion House conference in December, 1933. The present time was a transitional period. Whereas *we* had to crusade for the air, the new generation would take air travel for granted.

Sir Robert McLean, chairman of the S.B.A.C., proposed the toast of the guests, and was insistent on one very important point. Unlike other businesses it was necessary in all forms of transport to produce the supply which, in turn, creates the demand. Supply must come before demand. He congratulated the Post Office for its enthusiasm in the matter of air transport, and blamed the Air Ministry for its coldness.

In the absence of Sir Frederick Williamson, Wing Cdr. Wright replied for the guests. He rightly spoke of "air-mindedness," by itself, as a "lot of nonsense." Unless a passenger can gain time or obtain greater comfort he is not going to use the air.

The chairman-to-be, Mr. J. W. Bateman, of Hull, wound up the proceedings with a toast to the retiring chairman.

Blind Approach Installation

QUITE a number of interesting little points concerned with the installation of an airport blind approach system were brought up during the question period after Mr. Tomlinson's talk at the Central Hall on Thursday morning. Mr. Tomlinson, who is with Standard Radio, the licensees for the Lorenz system over here, naturally covered the actual operation of this system in fairly simple terms with the help of a demonstration panel.

Since the principles of the Lorenz system have been relentlessly described by different people at intervals during the past two years or more, it was a little disappointing to find that the majority of the delegates knew practically nothing about it and started, so to speak, at zero. If they had previously looked into the matter, Mr. Tomlinson's work would have been a good deal less difficult. As it was, however, the delegates interested themselves also in the matter of installation.

For an aerodrome where normal power supplies were available, both for the main and the marker beacons, Mr. Tomlinson gave the total cost of installation as being about £3,500—which, as aerodrome equipment goes, is not unreasonably high in proportion to the very considerable assistance provided.

He said that the most satisfactory compromise in beam plan divergence was a matter of 15 deg., or 7½ deg. of constant signal area on either side of the centre line of approach. Croydon's angle is apparently as sharp as 2½ deg. As far as approach path is concerned, the surroundings in the particular direction chosen should be absolutely clear above an imaginary line at an angle of 4½ deg. from the horizontal.

As far as the main beam was concerned, high-tension cables would have no effect on its shape, but such cables should not lie too near the actual transmitters. Normal supply cables lying beneath the ground could be ignored.

Those readers who are interested in the installation from the pilot's point of view should read an article which appeared in *Flight* of September 17 last year. In this the technique of approach was fully explained, and in previous articles the principles and a pilot's first impressions of the system had been dealt with. The first description, dealing with Berlin's installation, appeared in the issue of February 14, 1935.

Straight Out

LAST Friday the long-awaited Miles Straight Special made its first official appearance in final production form, and a batch are now well on their way towards completion.

The occasion was one of some importance, and among the many arrivals for the lunch party at Heston were Messrs. Powis, Miles, Hackett and Peckham, of the Phillips and Powis Company, and, of course, Mr. Whitney Straight. Three machines had been brought over by Mr. Powis, Mr. F. G. Miles and the latter's brother; one of these machines is fitted with a Villiers Maya engine—an installation which, if anything, improved its appearance—and Mr. Amherst Villiers will use this Straight as a flying test-bench.

Despite a high wind and the consequent bumps, Mr. Miles put up a very convincing display during the afternoon, and on one occasion did a spot landing, between the service hangar and the nearby boundary, which was almost Autogiroptic. With the help of the strong wind he appeared to use less than twenty yards of the available three hundred, and the machine touched down well and thoroughly stalled, tail-wheel first.

OFFICIAL DELIVERY: The first of the production Miles Straight Specials at Heston. Mr. Miles is entering (or leaving) the side-by-side cabin, while Mr. Whitney Straight stands on the "running board."

SOME AERODROME PROBLEMS

Papers at the Airports Conference : Those Landing Fees : Standardisation in Sight : Protection in Planning Schemes

TWO valuable papers were read at the Central Hall, Westminster, last week in connection with the Exhibition. Mr. Richard Ashley Hall was in the chair, and the audience was composed of figures prominent in the provision and management of aerodromes.

The first paper took the form of a memorandum outlining the definitions and principles on which were based a scheme of standardisation of aerodrome fees and charges—a subject which has been raised in the columns of *Flight*.

Mr. Gillman, before introducing the memorandum, proposed that the Maybury Report should not be discussed at that juncture, but suggested that when the members had had time to consider their opinions a complete meeting should be called to decide what action should be taken.

Mr. Gillman explained that during the past few years dissatisfaction had been expressed in several quarters at the varying fees and charges for the use of aerodrome facilities. Criticisms had been made not only by air transport concerns but by aerodrome owners and the view had been expressed that, if possible, a scheme for standardising charges should be adopted and applied throughout the country. It was not easy to devise a scheme which could be applied in a practical manner so as not to overburden the air transport industry and yet to give the aerodrome owner a commensurate return on his money.

Amounts and Methods

In August, 1934, the Aerodrome Owners' Association issued a memorandum which was the first step towards standardisation. This made no attempt to standardise the amount of charges, but only the methods of levying them. More recently the Executive Committee of the Association had again taken the matter up and had attempted to produce a scheme which would include not only a standardisation of the methods of making the charges, but also a standardisation of the charges themselves.

It was proposed that after the memorandum had been discussed the Executive Committee should proceed to lay down standard charges for the various services, and that these charges should be discussed with the Air Ministry and an attempt made to obtain universal approval and adoption. The final complete scheme would, of course, be circulated to all concerned before adoption.

Normally, the charge made for the use of any given facility bore a proportionate economic relationship to the cost of providing that facility. If aerodrome charges were based on cost they would be completely prohibitive, and as this was not desirable they had to be designed to cover aerodrome costs as far as possible without being exorbitant. If this were to be the case the aerodrome charge for any given machine should bear a direct relationship to the revenue being earned by that machine. Charges could properly be levied on an aerodrome for all services, including the following: (a) For the use of the aerodrome and including landing fees for the aircraft, load fees for passengers embarking or disembarking, and load fees for goods, mails or baggage, loaded or unloaded; (b) for housing for short or for long periods, for parking or picketing out in the open for periods in excess of two hours and for the use of the aerodrome at night; (c) practice landings; (e) storage or warehousing of goods (if these were not merely in transit a charge was to be made for storing); and (f) use of the compass base.

With regard to landing fees, although it was advisable that the major proportion of an aerodrome charge levied against any particular aircraft should be based on the revenue earned by that aircraft, it was only reasonable that a machine should bear a certain fee whether or not it was, in fact, earning revenue. It was unreasonable that an aircraft should pay the same landing fee on a landing ground as at a fully equipped airport. The fee levied at any particular aerodrome, therefore, should bear a relationship to the facilities provided.

As the landing fee bore no relationship to earned revenue, it should be assessed on a scale relative to the physical properties of the aircraft. The most convenient scale, it was maintained, was all-up weight, and for the sake of simplicity aircraft should be divided into weight classes.

It was considered that landing fees should be payable in the following manner: (1) by all aircraft using an aerodrome; (2) on the basis of maximum permissible weight authorised by the Certificate of Airworthiness; (3) in regard to commercial services, rebate could be allowed on a scale to be adopted, these rebates to be made on landing fees and load fees and to be repaid to the air transport company as mutually agreed; (4) an aircraft landing or taking off at night should pay a night fee; (5) charges for practice landings could be a matter for contract between the proprietors of the aerodrome and the individual or flying school concerned; (6) "aerial work" aircraft (as defined in sub-division (e) Section III (1) Classification of Aircraft A.N.D.13) should pay twice the amount of landing fees payable by other commercial aircraft.

The memorandum then turned to the question of load fees. It explained that the aerodrome charge for the aircraft carrying passengers and/or goods or mails or excess baggage, should be assessed on the number of passengers and the volume or weight of goods, etc., embarked or disembarked. For the sake of simplicity an equivalence should be drawn between a passenger, a certain weight of goods, and a certain volume of goods. This charge should be known as a load fee and should be standardised at all aerodromes and landing grounds in Great Britain.

The Question of Distance

The revenue an aircraft operator could receive from any given flight of a given aircraft was largely governed by the distance between the point of departure and the point of arrival. Thus, on very short flights, the load fee might absorb an unreasonable percentage of the gross revenue of any particular aircraft. It was appropriate, therefore, to make a reduction by means of a rebate in the load fee for such flights.

Charges should be made for the housing of aircraft at schedule rates, except in special circumstances. It was proposed to make these charges on the basis of the area covered by the aircraft and not the weight, the area to be calculated on the basis of span × maximum length. In the case of machines with folding wings, the basic charge per square foot of area covered was to be increased by 20 per cent. or one-fifth. The area of an aircraft with folding wings was to be calculated by multiplying the folded span by the length. Machines with folding wings need not be folded provided there was sufficient room in the shed to house the aircraft with the wings unfolded, but if the aerodrome proprietor required the wings to be folded, then they must be folded. The basis of calculation for housing charges was to be "Y" pence per square foot of floor area covered. This rate "Y" was to represent the rate per day per square foot, and was to be the basis of the charges for housing for 24 hours or part thereof. If an aircraft was to be housed for longer periods than 24 hours, then the following scale was to be adopted: For one week, area of aircraft × Y × 6; for one month, area × Y × 20; for a contract for one year, area × Y × 18 × 12. It was explained that "Y" would be first multiplied by the number of square feet of area covered in each case.

When three or more aircraft belonging to the same owner were housed at the same aerodrome for a period of one year or longer, the owner of the aerodrome might allow a rebate of up to 10 per cent. on the housing charges.

The charge for parking or picketing out in the open for periods in excess of two hours was to be one quarter of the normal housing rate. Parking and picketing out at night was to be allowed only if no hangar space was available.

If a hangar was rented for the exclusive use of a commercial user, the charge for that rental was to be not less than 50 per cent. of the daily rental value based on "Y."

The rate of charges should vary according to the class of aerodrome. Each aircraft was to be treated individually.

The housing charge for private owners should include the free use of the aerodrome; the aircraft must, of course, pay an initial landing fee on arrival at the aerodrome.

There should be three classes of aerodrome, A, B and C, and it was suggested that a Classification Committee should be set up and should consist of representatives of the Aerodrome Owners' Association, and if possible the Air Ministry. This committee was to allocate a class to each aerodrome in the country, and should, as a first step, examine the present schedule of classification as drawn up by the Air Ministry and make amendments where they were considered to be desirable.

The brief discussion on the memorandum emphasised a ticklish point. What would be the position of the ferry-service operator? Would not the rebates outlined in the memorandum be insufficient in the case of high-frequency "short haul" services? A suggested scale of additional rebates, it was revealed, has been drawn up.

Normal landing fees were payable for aircraft making test flights, unless an appropriate contract were drawn up by the aerodrome authorities and the owners concerned.

Loads *passing through* an aerodrome (e.g., passengers transferring from one machine to another) were to be charged only a disembarking fee.

PROTECTION IN PLANNING

AS a work of reference, the paper contributed by Mr. B. S. Brueton, A.R.I.B.A., M.T.P.I., on the protection of aerodromes in planning schemes should be of great value.

The paper explained that a planning scheme was usually prepared by a local authority for land within its boundary, or by a joint committee of local authorities for land within their areas, or by a local authority for land in the area of an adjoining authority, e.g., a municipality could include in its scheme land that was in an adjoining rural district. The approval of the Minister of Health to the proposals of a plan was necessary. Where land outside a town was included in a scheme, the general practice was for the municipal authority to assume the financial responsibility for such proposals as aerodromes, etc., which might be planned outside the municipal boundary.

A planning scheme prepared under the Town and Country Planning Act, 1932, consisted of a number of clauses, together with a map to which the clauses referred. After a scheme had been prepared, adopted by the planning authority and approved by the Minister of Health, it became operative with the force of an Act of Parliament.

During the period of preparation of the scheme, a planning authority had wide powers of control. For example, it could refuse permission to develop a site which was intended as an aerodrome, and when the scheme became operative, the reservation became permanent and binding upon both the local authority and the land owner.

It was explained that the machinery of the Act also formed a convenient method of protecting aerodromes (both prospective and existing) against the incidence of nearby obstruction in the form of buildings in the vicinity of the aerodrome, and after a scheme became operative the height of trees could be controlled.

Protective Prohibition

A planning scheme might contain the following provisions relating to aerodromes: (1) the reservation of land and provision to secure that, pending acquisition, the site should not be built upon or spoilt; (2) provision to secure that both before and after the aerodrome was laid no building should be erected in the vicinity to such a height as might be likely to cause obstruction to aircraft using the aerodrome; (3) provision to secure the prohibition of all building upon land in the vicinity of the aerodrome in cases where this was deemed to be necessary for safe-guarding aircraft; (4) provision to control the erection and the display of illuminated sky signs or beacons, likely to cause confusion with aerodrome lights; and (5) provision relating to the height of growing trees.

In the majority of cases provisions on the above lines were included in planning schemes in connection with proposals for a *public* aerodrome. It was provided, however, that a local authority might decide, instead of preparing a scheme of its own, to adopt a scheme proposed by owners of land in the area, and so it appeared to be possible to include in a planning scheme by agreement with the owners concerned, proposals relating to privately owned aerodromes. In this case the scheme should also include a clause providing that all expenses of the matter should be borne by the aerodrome owners and not, it should explain, by the promoting authority.

Where there was no existing aerodrome, the selected site should be given a distinctive colouring on the map of the scheme, and a clause should be inserted in the scheme itself stating that the selected site was reserved for the purpose of an aerodrome, and that until land was acquired and laid out by the responsible authority, no persons should, except with the consent of that authority, erect a building or execute work of a permanent character or make any permanent excavation upon or near the land, if it would be necessary to remove or alter the buildings or work, or to reinstate the land in order to enable it to be used for the purpose for which it was reserved.

The effect of this reservation was to sterilise the site pending its acquisition by the council. The actual purchase should be done either by agreement or by the exercise of powers outside those of the Town and Country Planning Act (e.g., the Air Navigation Act), but permanency of use after it was acquired would be secured by a clause in the planning scheme to the effect that after the land was laid out for an aerodrome, no buildings should be erected or works executed upon the land other than buildings or works for, or incidental to, the purpose of the aerodrome. It was explained that where the site was already secured by the authority as a public aerodrome or was privately owned, it was coloured on the map accordingly, and the effect of the scheme was then to make the existing use permanent until such time as it might become necessary to promote a varying scheme to remove the reservation.

Turning to the question of protecting aircraft from danger, the lecturer explained that a planning scheme could afford very complete protection from the date of approval of the scheme (i.e., even before the actual site was acquired) and this protection was secured by a clause which provided (1) that no buildings should be erected so as to project above a line drawn at a certain angle to the horizontal from the point on the boundary of the aerodrome which was nearest to the proposed building, and (2) that within a certain distance of the boundary no buildings should exceed a certain height.

Height Limitation

The limiting angle which was adopted by the Minister of Health in consultation with the Air Ministry was 3½ deg. This might be interpreted approximately as a gliding angle of 1 in 16.

If, however, this limiting angle were the only factor of control it would not operate to prevent a structure of any height if it were placed sufficiently far away, and so another factor, maximum height, should be introduced.

There was no prescribed figure for maximum height. The Ministry suggested 100 feet; but unless that figure represented the general building height level, it appeared to be much too high.

Where the surrounding area was known to be a normal residential suburb, it would cause little hardship to limit the height to, say, 30ft., which permitted the erection of the usual two-storey dwelling (assuming the ground was not above the level of the aerodrome itself). Where there was doubt as to the character of the ultimate development, it would be reasonable to prescribe a maximum height of 50ft.

In order to avoid dispute, it would be necessary to define carefully the words "height" and "building." The former might be defined as "measured from the mean level of the natural ground surrounding the building to the highest point of the building," and the word building as "including agricultural buildings (which were normally exempt from planning control), towers, turrets, spires, chimneys, poles, masts, pylons, electric cables, overhead conveyors, and any other structure or erection."

It was to be noted that height restriction near aerodromes was merely the more intensive application of a general height restriction clause, the main difference being that isolated chimneys, spires, etc., were allowed under the general clause, but prohibited in the vicinity of the aerodrome. This was because it was the isolated tall structure which constituted a danger to aircraft and not the general height of buildings.

Where there was a hill sufficiently near the aerodrome to rise above the imaginary inclined plane formed by the operation of the 3½ deg. rule already mentioned, the portion of the hill standing above that imaginary plane might be defined on the map, and a clause inserted prohibiting all buildings of whatsoever kind in the defined area.

Large electrically illuminated sky signs in the vicinity of an aerodrome might be a potential source of danger to aircraft in bad visibility as they were liable to be out of action at such time or to be mistaken by the pilot for navigational lights or

beacons of the aerodrome. It might be true that a privately owned sky sign could be recorded in Air Ministry regulations as a land mark, but, being privately owned, there was usually no guarantee that it would be in constant operation to serve the purpose of a landmark. There was also the possibility of electrical interference with navigational apparatus in use at aerodromes of a major type.

The lecturer did not know of any planning scheme in operation containing a clause to control such signs.

The height of trees likely to be a danger could also be controlled within the defined "controlled area" by means of a clause providing that where a tree was considered to extend above the height to which a building would be permitted on that spot, and that in the interests of safety the tree should be cut down or reduced in height, the council might serve a notice upon the owner or occupier that they intended to enter on the land to do what was necessary. If, within four days, the owner or occupier objected, the objection was referred to an arbitrator appointed by the Minister.

Mr. Brueton anticipated that the council would offer suitable compensation.

Height restriction under a planning scheme in a general way was not a subject for compensation, but the Minister of Health would not approve provisions which were not reasonable.

Special restriction in the vicinity of the aerodrome was a matter of degree, and it appeared that if the figure of 30 to 50 ft. was reasonable under a planning scheme for general height zoning the additional restriction due to the control of isolated tall structures (which was the nett effect) was not likely to give rise to heavy claims for compensation.

The Lucrative "Fringe"

If a sum were available for purchasing a fringe of land around the aerodrome for the purpose of keeping it free of all buildings, it was, of course, an advantage to do so, and such land after acquisition could conveniently be appropriated for such purposes as public parks, playing fields, golf courses, or public allotment. Some of these uses would provide a monetary return.

In conclusion, Mr. Brueton submitted a typical clause for inclusion in a planning scheme.

During the subsequent discussion, a speaker referred to the "sterilising" effect on the land pending acquisition by the council. He said that many town planning schemes were already going through and in many districts schemes had been approved, but he wondered if he was right in saying that it did not really matter so far as reservations were concerned. Under the new Air Navigation Act issued this year, nobody could prospect a site without the consent of the Air Ministry.

Mr. Brueton replied that the advantage of doing things under a town planning scheme was that it was also possible to control the land around the aerodrome by preventing obstructive buildings.

Mr. Gandar Dower did not want to enlarge the scope of the discussion because he took it that the Town Planning Act was compiled for municipalities, but he wanted to ask from the point of view of private owners what sort of protection they had. What, he said, was to prevent his building a nice, tall factory?

Mr. Brueton explained that a town planning scheme had to be prepared by a local authority. But the private owner could go to the planning authority and say that he was preparing a scheme and ask for a clause to be inserted. If this was done, it was only fair that the aerodrome owner should bear the cost.

Mr. Burleigh, of Westlands, visualised a case where some gentleman came along and bought land around a well-established aerodrome and claimed compensation. He felt the system was open to abuse.

In replying, Mr. Brueton explained that the Town Planning Act provided for a general height restriction, but it was not subject to compensation. The 3½-degree angle was subject to compensation.

Mr. Ashley Hall emphasised the importance of co-operating with housing committees, public parks committees, etc. It was up to an owner of a private aerodrome to ask the town planning authorities to make arrangements so that his aerodrome would not be spoilt and to bear in mind his requirements when carrying out the scheme.

Helpful Authorities

Mr. Gandar Dower said that in the case of his own particular aerodrome he received within six months of establishing it a request from the local authorities that he should inform them if they could use any of their powers to help to protect his aerodrome. He did not take the communication very seriously, as he did not see how they could help him, but it showed how local authorities were ready to assist. He wanted to know if there was any basis of compensation that could immediately be handed to the owners of land round an aerodrome, or whether they had to prove that they intended to put up something special and on those grounds claim compensation.

Mr. Brueton's reply was that he did not know if there were any statistics. Immediately a person put in a claim for compensation, the planning authorities put in a counterclaim for betterment. The betterment had to be assessed and set against the compensation, and 75 per cent. of the betterment had to be accredited to the planning authority. There was an attraction to some people to live on the outskirts of flying areas. There had been practically no claims for compensation; the whole thing was a bogy.

A representative from Oxford explained that his Municipality owned an aerodrome situated in someone else's area and wanted to know if a paragraph could be inserted in the scheme for the neighbouring area or whether his Municipality could apply to become the operating authority themselves.

The answer was that he should approach as a private owner.

Mr. Whitaker, of Cardiff, referred to the statement that no buildings should be allowed to rise above a height of 30 ft. measured from the natural level of the ground. He wanted to know whether "ground" should not be "aerodrome."

In reply, Mr. Brueton said that the general ground level would be flattish. It was not suggested that a site should be taken on a dead-level surface. A height of 30 ft. was a reasonable height.

Councillor Bateman moved that a vote of thanks be extended to the retiring chairman, Councillor Ashley Hall. This was seconded by Mr. Newton, of Sywell. Mr. Ashley Hall assured the gathering that the three years he had been in office had been full of tremendous interest and pleasure.

Wolseley Aero Engines—An Announcement

AN important announcement has been made regarding the future of Wolseley aero engines, which, it will be remembered, formed the basis of contention in the recent difference of opinion between Lord Nuffield and the Air Ministry.

It comes from the Scottish Aircraft and Engineering Co., Ltd., manufacturers of the British Burnelli aircraft. They state that they have completed negotiations with Lord Nuffield for the purchase of his aero engine business, including the whole of the plant and machinery of Wolseley Aero Engines at Birmingham. The negotiations have been made through Chamier, Gilbert-Lodge and Co.

Included in the arrangement is an understanding that the whole of the business—including the plant and machinery—shall be transferred to a distressed area. Scottish Aircraft, therefore, have decided to build a modern works on the Clyde, where skilled labour requirements can be satisfied.

A new company, the Clyde Aero Engine Co., Ltd., has been formed to build the Wolseley range of 250-500 h.p. engines in this new factory. These engines will in future be known as Clyde aero engines.

From a Sister Industry

ALMOST a household name in the automobile coachbuilding world is that of Abbey Coachworks, Ltd. Thus it is particularly interesting to learn that they have now extended their work to include aircraft upholstery.

A very well-known aeronautical engineer, Mr. W. O. Manning, F.R.Ae.S., has been appointed consultant.

The upholstery work includes soundproofing, and efficiency tests can be made with recording instruments. Abbey Coachworks are also in a position to design and manufacture all types of aircraft chairs, cabin fittings, etc., and are ready to undertake metal work, such as cowlings, spats and fuel tanks. They state that they are willing to consider the layout of additional plant should an order warrant it.

Lastly they have organised a service department for aircraft upholstery repairs, which can be carried out at "emergency" notice, and have drawn up a scheme for contract maintenance of airline cabin interiors.

The managing director of the firm—whose works are on the Chase Estate, Park Royal Road, London, N.W.10—is Capt. A. A. Curry.

MAGNESIUM ALLOYS

Their Use in Aircraft Construction : Many Difficulties Still to be Overcome : Beryllium Found too Brittle : A Lecture by Professor C. H. Desch

AS the standards of aircraft performance are raised, possible saving of weight is becoming of ever greater importance, so that more and more interest is being taken by aircraft constructors in metals lighter than aluminium. Recently Professor C. H. Desch, Superintendent of the Metallurgical Department of the National Physical Laboratory discussed, before the Royal Aeronautical Society, recent work on magnesium and other light alloys, much of which has been carried out at the National Physical Laboratory.

"Since," Professor Desch said, "the light metals of the alkalies and alkaline earths are ruled out for constructional work by their chemical activity as well as by their softness, only beryllium and magnesium are left among the elements lighter than aluminium. Beryllium has unfortunately disappointed expectations, for although its crystal structure indicates that it should be possible to render it ductile, all the metal so far produced has proved to be brittle, nor has any means been found of alloying it with small quantities of another metal so as to make it ductile. With a specific gravity of only 1.84, an elastic modulus which is believed to be very high, and a melting point of 1278°C., beryllium would seem to offer remarkable advantages, but the long investigations carried out in Berlin and at the National Physical Laboratory have not so far resulted in the production of new light beryllium alloys, although attention is now being again directed to the alloys with aluminium. At the other end of the series alloys of copper and of nickel, containing small quantities of beryllium, have shown remarkable properties and have found technical application."

Atom Diameters

"It might have been expected," he continued, "that a useful alloy could be made by combining beryllium with magnesium." This had not proved to be the case, however, and he suggested that the reason lay in the fact that the effective diameter of the magnesium atom is much larger than that of the beryllium atom, spheres of such different sizes not being able to pack closely together.

"It is remarkable," he said in this connection, "how often purely geometrical factors outweigh those of chemical similarity in determining the structure of alloys, and new light is constantly being thrown on metallurgical problems by the application of ideas of atomic arrangement in metallic crystals. It is becoming more and more possible to decide beforehand which elements may with advantage be added to a given metal to produce a useful alloy with given properties, although the complexity of most of the mechanical properties prevents the process from being quite simple. It may, however, be said that theoretical knowledge plays an ever increasing part in the development of alloys."

Magnesium is too weak a metal to be used in the unalloyed state, and the metals which may be added to it to produce strong alloys are limited in number. In fact, taking all the factors into account, only aluminium and cadmium are suitable for alloying in comparatively large quantities, although calcium, cerium, nickel, cobalt and manganese have proved useful in small quantities.

It is rather surprising to find that magnesium alloys are remarkably easy to cast. This comes about, Professor Desch said, from the fact that molten magnesium has very little power of dissolving gases, so that magnesium alloys do not suffer from the sponginess caused by the liberation of gases at the moment of freezing. In casting it is necessary to use a suitable flux and a protective atmosphere during pouring. These conditions are now well understood and no difficulties are experienced in the foundry. In annealing processes similar protection is necessary, and the special technique adopted has resulted in making a magnesium alloy foundry a remarkably clean and inoffensive place.

Excellent castings of magnesium for the production of aircraft parts which are not too highly stressed can be produced, and it is possible to make intricate shapes without great difficulty. Both sand and chill castings are used. By casting in dies very satisfactory castings, involving a minimum of machining, are obtained with a higher strength than sand castings.

"One of the most valuable means of increasing the strength of an alloy," Professor Desch continued, "is by the process known as age-hardening . . . . Put briefly, the process depends on finding some constituent which may be added to an alloy, capable of passing into solid solution at a high temperature and being retained on quenching, but separating, at first in an ultra-microscopic form, when the quenched alloy is reheated to a lower temperature, or in some instances even spontaneously at the temperature of the air." Exhaustive search at the N.P.L. for suitable magnesium alloys suggested that those containing silver were the most promising. The fact that silver was relatively costly is of little importance, since in the articles of the type produced the cost of manufacture was much greater than that of the material used.

In discussing the "working properties" of magnesium alloys, Professor Desch described how the crystalline structure of the ingots affected the process of working. The form of the crystals in magnesium alloys was such that it was possible to produce material which was ductile in one direction and brittle in another. Such difficulties were overcome by making the crystal grains as small as possible by casting the ingots at a high temperature.

Extruded Sections

Extrusion and pressing between heated dies have both been applied successfully in commercial practice. Rolling, Professor Desch said, gives a structure with highly directional properties. Rolling at a very low speed allows much more change of section without cracking. To overcome this difficulty, mills run at very low speed are used industrially.

Although data as to the actual properties of magnesium alloys under prolonged stress at high temperatures are somewhat scanty, the indications are that the new alloys retain their strength remarkably well at high temperatures. Pistons made from these alloys have given excellent results in trial runs under overload.

Concerning the vexed question of corrosion, Professor Desch was not able to announce complete cures. Three anti-corrosion treatments had been devised, viz., using chromate, fluoride and selenium respectively. The fluoride and selenium processes did not, he said, seem to have got beyond the experimental stage as yet, and the industrial processes in use all involved the production of a chromate film in one way or another. For the protection of airscrews he thought a hard metallic coating of some substance such as chromium was the most promising line of attack. It was not practicable to deposit chromium directly on the magnesium alloy, but the production of an intermediate metallic coating capable of receiving an electrolytic deposit of chromium seemed promising, and some success had already been achieved.

De Havilland's A.G.M.

AT the seventeenth annual general meeting of the De Havilland Aircraft Co., Ltd., held last week, the chairman, Mr. A. S. Butler, reported a net profit on the year's working of £71,709, compared with £77,367 for the previous year. The small decrease was largely due to the fact that provision for the future expanded programme had involved increased overhead expenditure which was not immediately productive.

Among the interesting figures quoted by Mr. Butler was the final payment of £5,000 made in respect of the Hamilton airscrew licence, bringing the total cost up to £16,030.

Satisfactory progress was reported in the sales of various types of the company's aircraft and Gipsy engines, and other activities, such as the training schools at Prestwick and Maidenhead, were showing excellent results.

The present programme of Government work, said Mr. Butler, did, to some extent, inevitably interrupt their establishment policy in concentrating on civil aviation in its manifold and promising phases with the result that the development of new types of civil and commercial machines might be retarded. They were confident, however, that any lack of progress in this all-important side of their business was only a temporary phenomenon.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —

THE LATEST EXPRESS: This view of the new D.H. 86B clearly shows the details of the new tail unit which has been designed to improve the handling qualities, particularly on full load. Improvements have also been made to the undercarriage. This particular 86B was about to be delivered to Blackpool and West Coast Air Services. (*Flight* photograph.)

THE WEEK AT CROYDON

The Oxted Accident : Flotsam : False Alarm : Results of Cogitation

AVIATION has suffered another calamity at Croydon in the accident to the Air Dispatch machine, details of which are recorded elsewhere. Everybody will regret the loss of Capt. Jones-Evans, and Mr. Jimmy Walker, the radio operator, was a popular figure at the airport. He had, I believe, been on the early morning newspaper service for a longer period than any operator. A tale is told of a morning when radio communication was essential, but when the set in the machine had packed up. He asked the pilot to circle for twenty minutes, took the set to pieces, reassembled it, and got into contact with Croydon.

Relative Dangers

Ordinary people rarely remember the sterling work done day in and day out, year after year, by companies carrying newspapers and freight over to Paris in the very early hours. Nor do our newspapers notice that the record of air transport compares favourably with that of sea transport during the difficult months. Recently ships have been sinking and sending out S.O.S. messages, oil has been poured on mountainous seas, and perilous rescues have been made while air transport has been operated much as usual. It was strange, indeed, that the machine was not found until the same evening, though it lay within twenty-five yards of a main road over which, searchers tell me, petrol fumes hung so heavily that the air was dense with them.

On Saturday morning another dawn machine had to turn back when crossing the Channel, and the operator wisely jettisoned the cargo of newspapers in the Channel. There is a story (in which I have little faith) that the last bundle of papers to be thrown overboard landed somewhere inland, alongside a ruminating country constable. He is said to have placed it under arrest and sent it to the Commissioner of Wrecks, Rye Harbour.

On Sunday morning, at about 4.30 a.m., some jolly soul barged into one of the fire alarm buttons on the airport, and the syren did its worst for about a quarter of an hour, rousing all sorts of poor fellows over an enormous area. Another notable event also occurred on that day. The good ship *Heracles*, commanded by Capt. Rogers, shook everyone to the boot heels by making the Le Bourget-Croydon trip in 1 hour 28 minutes, whereas an Air France Wibault took 1 hour 31 minutes. It was either a case of a built-in tail wind or of steering such an exact course as to cut off all superfluous corners. Meanwhile, pilots going the other way in not-so-fast machines sat happily aloft for hours, glowing with thoughts of the flying pay they were earning.

Capt. (Buddy) Messenger has returned to Croydon for a time. He is one of those splendid folk who started as a mechanic and is now an Imperial Captain. He was in command of *Hanno* when the machine was down in the desert for a couple of days or so and earned golden opinions from his passengers for the way in which he looked after them. He is taking the flying-boat course whilst in Europe and is flying as supernumary on *Scylla* and *Syrinx*, which are not yet on his ticket. One wonders if he will be flying for a time on European routes to relieve one of the old hands, who find precious little time to devote to swotting for a first-class navigation ticket and who cannot easily be spared to do the flying-boat course.

Fast Travelling

A couple of K.L.M. passengers stepped off the boat from New York last week at about 12.30 p.m. at Southampton and reached London 4 p.m. They left Croydon at 6 p.m. for Amsterdam and left there again the same night, or very early in the morning, for Jodhpur, which they reached on the fourth day out.

About the Maybury Committee and its findings—which broke on a dazed world (which had breathlessly awaited something epoch-making after all that brooding) with about as much effect as a bomb full of feathers—I see that the bright green aeroplane belonging to a certain newspaper has left, or is leaving, Croydon to look into the whole matter, and that the newspaper's motoring corre-

Commercial Aviation

spondent is the expert on board. It would have been nice if the horse-racing expert and the chess correspondent had gone along, too.

Municipalities are urged not to mind spending money on airports, but, at the same time, not to mind losing money for many years to come in the interests of civil aviation. On the other hand I hear that a certain prospectively important airport is to be abandoned and built over. That isn't a very good example to the municipalities.

A. VIATOR.

Gloucester-Cheltenham

A "PUBLIC-USE" licence has now been issued for the Gloucester-Cheltenham aerodrome, which lies four miles north-east of Gloucester. The Westgate Motor House Company will manage it for the municipalities concerned. The area is circular and about 640 yards in diameter.

Casablanca-Tangier

ON their South American mail route Air France have now resumed the service between Tangier and Casablanca, which they suspended three months ago owing to anti-aircraft activities in the Straits. The route was diverted from Tangier to Fez and Oran, and mails had to be carried by rail to Tangier from Casablanca, finishing the journey to Lisbon by the Aero-Portuguesa line. The Air France South American service is now timed to connect with Aero-Portuguesa's weekly Lisbon-Tangier service, thus ensuring a three-day delivery of mail between Lisbon and Brazil.

The Lioré 47

THE Lioré et Olivier 47 for the South Atlantic has completed her tests at Antibes. Estimated performance figures have been exceeded and Commandant Bonot appears to be more than pleased with the machine.

The latest figures are: Maximum speed 225 m.p.h.; and cruising speed, using 75 per cent. of available power, 188 m.p.h. The "47" is capable, with a normal fuel load, of a non-stop flight of twenty hours, which gives it a range of 3,750 miles—good enough for the North Atlantic.

Dublin's Airport

WORK has now started on the new municipal airport at Collinstown, Dublin. The Government has purchased an additional hundred acres of land, and it is expected that the completed aerodrome will cover about five hundred acres. The new site adjoins the disused military aerodrome at Collinstown, just off the main Dublin-Belfast road, and about six miles from the centre of the city. The hangars, some of which have collapsed, will be reconstructed.

When the new municipal airport, which will cost nearly £200,000, is completed the military aerodrome at Baldonnell will be closed to private and commercial aircraft. Some six years ago a company known as Irish Air Services rented Collinstown aerodrome from the Government and operated one machine for a short time. It has not been used since.

Blackpool and Gatwick

AFTER an investigation of the accident to a Northern and Scottish Airways' Spartan cruiser at Blackpool on November 20, the Inspector of Accidents came to the conclusion that the pilot, owing to a misconception or inexact knowledge of the true orientation of the aerodrome, failed to set off on a compass bearing which would have given him the full length of the aerodrome for the blind take-off. The course he actually took, in error, was across the narrowest part and directly towards a hangar, which was only some 270 yards from where he started his run.

An enquiry into the accident which occurred near Gatwick on September 15, produced no startling conclusions.

The accident occurred at about 22.09 hours (B.S.T.) on a fine but slightly misty night, shortly after the machine had started for Cologne. It took off towards the west, turned to its left, followed a left-hand circuit of the aerodrome until it was heading in an easterly direction, when, instead of proceeding on a straight course, it continued turning to the left, losing height as it did so, and finally crashed in a field about half a mile to the south-west of the airport.

The Inspector came to the conclusion that the available evidence was insufficient to determine the cause of the accident, but that the possibility could not be dismissed that the occupant of the second pilot's seat—the radio operator—accidently interposed his left foot (which became caught) between the second pilot's rudder-bar and a fire extinguisher, a fixture on the floor of the cockpit. The result was that the movement of the rudder controls was obstructed to an extent that caused the pilot to lose control.

Unique Experience

FOR many years a transport pilot in New Guinea, Mr. Richard Allen is now in England with the idea of studying transport flying over here and, if possible, of securing a position as pilot with one or other of the companies.

It may be remembered that Mr. Allen once made fifteen double trips between Wau and Salamana in one day—a total distance of 1,200 miles, each trip taking him over 6,000 feet mountains. In 1932 he flew his own Gipsy Moth from England to Melbourne.

North Sea Plans

REGISTERED as long ago as March, 1935, to watch commercial aviation developments for a group of shipping companies, British Coastal Airways has plans for a flying-boat service between Newcastle-on-Tyne and Denmark (Esbjerg and Copenhagen). The idea at present is to use the harbour formed by the North and South Shields piers as a base. Mr. John Gillie, the son of Mr. G. T. Gillie, a Tyneside shipowner, is the managing director of the company.

Two Accidents

ON January 21 an Avro 504 N belonging to Plane Advertising, Ltd., was lost in the Irish Sea on its way from Speke to Newtownards. The passenger, Mr. C. Poole, was picked up by the steamer *Corrib*, but the pilot, Mr. E. G. Stewart, went down with the machine.

On the following morning at dawn an Airspeed Envoy, used by Air Dispatch for their newspaper service to Paris, crashed on Titsey Hill, Oxted, soon after leaving Croydon. Mr. G. S. Jones-Evans, the pilot, and Mr. J. Walker, the operator, were killed. The machine had been missing for seventeen hours before it was discovered in darkness of the same evening. Mr. Jones-Evans was previously with Crilly Airways and was a very experienced pilot.

Little America at Croydon

AIRCRAFT of other countries never fail to interest people outside their countries of origin, and there is a growing number of transatlantic aeroplanes owned and operated for gain or pleasure in England and Europe. Probably the Stinson, first introduced on this side of the Atlantic some two years ago by Brian Allen Aviation at Croydon, takes a major proportion of the credit for stimulating our interest in the products of the U.S.A. Then came the Cessna C.34, introduced by Surrey Flying Services, also of Croydon.

In August, S.F.S. were appointed Beechcraft representatives for this country, and more recently this company introduced the Porterfield 70.

The most natural and by no means the least important question of prospective purchasers of American aircraft is "But what about service, spares, and C. of A. renewals?"

Both B.A.A. and S.F.S. have always prided themselves on their stock of essential spares, and have now decided to pool their resources in an associated concern known as American Aircraft and Engine Service, Ltd., which is, of course, operating at Croydon. This company has appropriately commenced its activities by becoming the sole controlling representatives in this country for Wright and Lycoming engines, as well as representing Warner and Le Blond engines. A.A.E.S. have at their disposal a staff licensed to carry out complete or major overhauls on all these engines, while, on the C. of A. side, the staff drawn from S.F.S. has already successfully completed two Beechcraft and a Stinson renewal, and probably by the time this is in print that of a Cessna C.34.

Lastly, it should be emphasised that both the parent companies and the directors of A.A.E.S. could have done little without the invaluable co-operation tendered by the A.I.D., and particularly by its representatives at Croydon. This new organisation should have the further desirable effect of encouraging American "executives" and private owners to bring over their own aircraft to tour Europe, especially as they can so easily make the necessary arrangements through the company's New York representatives, Aviation Equipment and Export Inc., of 25, Beaver Street.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

A GALLANT AIRMAN

The *London Gazette* of Friday last, January 22, contained the following announcement:—

"His former Majesty King Edward VIII was graciously pleased to award the Albert Medal to Cpl. Archibald Charles Wood, No. 60 (II) Squadron, R.A.F., Kohat, in recognition of his conspicuous gallantry when the Royal Air Force aircraft in which he was a passenger was wrecked near Nidauli, India, on February 8, 1936."

Cpl. Wood, who was uninjured but dazed as a result of the crash, re-entered the blazing wreckage in an endeavour to save the pilot. He received very severe burns, as a result of which his left hand had to be amputated.

ANOTHER NEW SQUADRON

No. 144 (Bomber) Squadron formed at Bicester on January 11. The unit is being equipped with medium bomber aircraft and is placed in the Bomber Command, in No. 1 (Bomber) Group, until it moves to Hemswell on February 9, when it will be transferred to No. 3 (Bomber) Group.

MOVE OF UNITS TO DHIBBAN

The undermentioned unit moved from Hinaidi to Dhibban with effect from October 5, 1936.

No. 5 (Arabian) Company, Iraq Levies.

The undermentioned units moved from Mosul to Dhibban with effect from the dates stated:—

Supplies Depôt, November 2; No. 8 (Kurdish) Company, Iraq Levies, December 12; No. 1 Section, No. 1 Armoured Car Company, December 14.

NOMENCLATURE OF AERO-ENGINE

A new engine of the Pegasus series, differing from the Pegasus X in respect of supercharger gear ratio, airscrew shaft, crankshaft and other design details, is being introduced into the service. The official name is Pegasus XX.

The rating and other particulars are as follows:—B.H.P. 800/835 at 8,500 ft. at 2,250 r.p.m. Airscrew reduction gear ratio—0.5 : 1. Compression ratio—6.55 : 1.

FLYING ACCIDENTS

The Air Ministry regrets to announce that Sergt. James Bannon lost his life and Capt. Leslie Reid Warton, King's Dragoon Guards, was very seriously injured in an accident which occurred at Pibor Post on January 20 to an aircraft of No. 47 (Bomber) Squadron, Khartum. Sergt. Bannon was the pilot and Capt. Warton a passenger of the aircraft. A/C2 Thomas Luke Carpenter, the other passenger, was not injured. Capt. Warton died from his injuries on the same day.

Also that A/C1 Stanley Harvey lost his life in an accident which occurred at Kantara on January 20 to an aircraft of No. 4 Flying Training School, Abu Sueir, Egypt. A/C1 Harvey was the passenger of the aircraft and L.A/C Harold Norman Norris, who was not injured, was the pilot

FORMATION OF STATION HEADQUARTERS

A station headquarters will form at Usworth on February 1, on which date the station will be transferred to No. 1 (Bomber) Group.

NOMENCLATURE OF AIRCRAFT

The names of the Westland army co-operation aeroplanes fitted (i) with Mercury engine and (ii) with Perseus engine are Lysander I and Lysander II, respectively.

R.A.F. STATION, CALAFRANA

The spelling of the name of the R.A.F. Station at Calafrana, Malta, has been changed to Kalafrana, to accord with civil and post office practice.

R.A.F. STAFF COLLEGE

The following officers have satisfactorily completed the fourteenth course (1936) at the R.A.F. Staff College and are entitled to the letters "*p.s.a.*" after their names in the Air Force Lists of their respective services:—

ROYAL AIR FORCE

Sqn. Ldrs. W. E. G. Mann, D.F.C., J. F. Titmas, H. F. V. Battle, D.F.C., H. A. Haines, D.F.C., C. W. Weedon, F. F. Inglis, C. B. R. Pelly, M.C., W. J. M. Akerman, N. Carter, D.F.C., L. K. Barnes, M.B.E., J. H. C. Wake, and D. A. Boyle.

Flt. Lts. S. H. Hardy, N. S. Allinson, A. H. Willetts, D. F. W. Atcherley, A. D. Gillmore, G. P. Chamberlain, H. D. Spreckley, H. J. G. E. Proud, E. C. T. Edwards, F. E. R. Dixon, M.C., and M. S. Shapcott.

DOMINION AIR FORCES

Royal Australian Air Force

Flt. Lts. A. L. Walters and P. M. Rickard.

Royal Canadian Air Force

Wing Cdr. S. G. Tackaberry and Flt. Lt. B. G. Carr-Harris.

The following officers of the Royal Navy, the Army, and the Indian Army have satisfactorily completed the course:—

ROYAL NAVY

Cdrs. E. S. Brand, p.s.c., and P. G. L. Cazalet, p.s.c.

ARMY

Bt. Major C. P. Warren, M.C., p.s.c.

INDIAN ARMY

Major J. B. M. Steer, p.s.c.

R.A.F. BENEVOLENT FUND

The usual meeting of the Grants Committee of the above Fund was held at Iddesleigh House on Monday, January 11. Air Vice-Marshal C. A. H. Longcroft, C.B., C.M.G., D.S.O., A.F.C., was in the chair, and the other members present were: Air Comdre. B. C. H. Drew, C.M.G., C.B.E., Group Capt. C. H. K. Edmonds, D.S.O., O.B.E., and Wing Cdr. C. E. H. James, M.C. The Committee made grants to the amount of £487 12s. The next meeting was fixed for January 25.

ROYAL AIR FORCE GAZETTE

London Gazette, January 19, 1937

General Duties Branch

G. C. Matheson is granted a short service commission as Acting Pilot Officer on probation with effect from and with seniority of January 6.

The following are granted temporary commissions as Flying Officers on attachment to the Royal Air Force (January 5):—

Sub-Lts., R.N.—D. G. Bowker, N. R. Corbet-Milward, A. T. Darley, D. F. Godfrey-Faussett, R. S. Hankey, N. M. Hearle, A. T. J. Kindersley, M. R. Lemon, B. S. McEwen, M. R. Maund, G. M. T. Osborn, K. V. V. Spurway, H. C. C. Tanner, E. W. T. Taylour, R. J. Thoresby.

Lieutenants, R.M.—H. F. S. Bowen, O. Patch.

The following are granted temporary commissions as Flying Officers on being seconded for duty with the Royal Air Force with effect from January 6:—Lt. M. J. Muspratt-Williams, The Lincolnshire Regiment; Lt. G. F. Watson-Smyth, The Duke of Cornwall's Light Infantry; Lt. R. H. N. Graham, The West Yorkshire Regiment; Lt. B. B. St. G. Daly, The Lancashire Fusiliers; Lts. J. C. T. Gardner, Royal Artillery; Lt. N. B. Hallmark, The Cheshire Regiment; Sec. Lt. T. Adam, The Gordon Highlanders.

Pilot Officer on probation J. A. Richards is confirmed in his appointment (November 6, 1936).

The following Acting Pilot Officers on probation are confirmed in their appointments and graded as Pilot Officers:—J. N. Mahler, F. E. R. King, G. T. Openshaw (November 6, 1936); R. S. Allen, S. M. Bird, R. Clarke, A. A. Dilnot, F. R. C. Fowle, E. P. Mortimor, R. H. H. L. Oliphant, D. R. Stanley-Adams, F. C. Stibbard, K. T. Thompson, R. H. Warcup, R. A. Weeks, M. C. Wells (November 18, 1936); F. Aikens, A. Aitken, L. Aitken, A. J. Banham, J. E. Baskerville, D. J. Bassett, P. R. Beare, G. Beavis, J. Beavis, A. Beck, J. T. Bouwens, A. A. N. Breckon, H. R. P. Bridgen, R. S. Cannell, J. C. Claydon, W. H. Cliff, M. N. Crossley, F. J. L. Donaldson, P. M. J. Evans, M. F. C. Farrar, J. B. Flowerdew, A. S. Forbes, D Fortnum, A. Gadd, G. W. C. Gleed, J. H. Grant, I. D. Grant-Crawford, N. G. C. Heath, C. P. V. Hervey, D. H. Holmes, A. M. Jardine, A. N. Jones, K. V. Keen, J. G. Kerby, S. H. Kernaghan, C. J. F. Kydd, H. Y. Lawrence, E. J. Little, R. H. Lonsdale, R. E. Lovett, P. A. Matthews, R. J. Oxley, T. N. Partridge, A. R. Putt, C. A. Richardson, J. A. Richardson, F. C. Rivers, J. A. Roncoroni,

J. G. Sanders, G. R. Shepley, T. E. Shrapnell-Smith, A. L. H. Solano, C. R. D. Stewart, J. B. Stewart, R. N. Stidolph, W. N. Sykes, T. E. Syms, J. A. Thomson, C. D. Tomalin, A. W. T. Traill, J. F. H. Weston, F. E. Williams (November 25, 1936); D. E. A. Williams (November 29, 1936); G. L. Raphael (December 16, 1936).

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—A. H. Button (seniority November 19, 1935) (March 22, 1936); F. D. Terdrey (January 8); W. D. Disbrey, G. E. Peacock (January 15).

P/O. J. E. Thornton is promoted to the rank of Flying Officer (December 17, 1936); Flt. Lt. P. de C. Festing-Smith is placed on the retired list at his own request (January 11); Flt. Lt. R. C. Reynell is transferred to the Reserve, Class A (January 15); Flt. Lt. J. B. Tatnall is transferred to the Reserve, Class A (January 18); A.P/O. R. H. Weston is transferred to the Reserve, Class A (December 12, 1936).

Equipment Branch

The following Warrant Officers are granted permanent commissions as Flying Officers on probation with effect from and with seniority of January 8:—J. E. Watson, M.B.E., W. Dalton, H. F. Levell, E. J. Stephens, C. Darke, R. W. Ware, J. E. Hatfield, J. W. Lamb, W. R. McCleery, A.F.M., H. P. Simpson, M.M., A.F.M.

F/O. J. W. C. Revill is promoted to the rank of Flight Lieutenant (January 10); Wing Cdr. P. M. Brambleby is placed on the retired list (January 20).

Medical Branch

F/O. R. F. Wynroe, M.B., Ch.B., D.M.R.E., is promoted to the rank of Flight Lieutenant, with effect from December 2, 1936, and with seniority of December 2, 1935; F/O. W. J. Mitchell, M.R.C.S., L.R.C.P., resigns his short service commission (December 22, 1936).

Commissioned Signals Officer

W/O. W. M. E. Cannock is granted a permanent commission as Flying Officer on probation with effect from January 8 and with seniority of October 26, 1936.

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

F/O. A. C. Walker is granted a commission as Flight Lieutenant in Class C (January 12); F/O. T. L. Harrison is transferred from Class A to Class B (July 1, 1936); F/O. E. E. Noddings is transferred from Class A to Class C (September 13, 1936).

The notifications appearing in the *Gazette* of the dates stated concerning the following officers are cancelled:—March 17, 1936, Flt. Lt. R. L. Bateman; May 5, 1936, F/O. R. Beresford; June 16, 1936, F/O. D. J. Stewart; July 7, 1936, Flt. Lt. R. H. Holmes, F/O. T. F. Steele; August 11, 1936, F/O. D. L. Townsend; September 15, 1936, Sqn. Ldr. J. L. N. Bennett-Baggs.

AULILIARY AIR FORCE

General Duties Branch

No. 600 (CITY OF LONDON) (FIGHTER) SQUADRON.—P/O. A. G. Maclachlan is promoted to the rank of Flying Officer (October 18, 1936).

No. 601 (COUNTY OF LONDON) (FIGHTER) SQUADRON.—F/O. P. J. Clive relinquishes his commission on completion of service (September 27, 1936).

Medical Branch

No. 600 (CITY OF LONDON) (FIGHTER) SQUADRON.—Flt. Lt. H. W. Walter, M.D., B.S., relinquishes his commission on completion of service (December 12, 1936).

AUXILIARY AIR FORCE RESERVE OF OFFICERS

General Duties Branch

P. J. Clive is granted a commission as Flying Officer in Class A (September 27, 1936).

Medical Branch

H. W. Walter, M.D., B.S., is granted a commission as Flight Lieutenant in Class D (December 12, 1936).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders.—C. E. V. Porter, to No. 4 Armament Training Camp, West Freugh; to command, 1.1.37. M. Moore, O.B.E., to Directorate of Staff Duties, Air Ministry, vice Wing Cdr. A. H. Orlebar, A.F.C., 1.1.37. R. H. M. S. Saundby, M.C., D.F.C., A.F.C., to Directorate of Operations and Intelligence, Air Ministry, vice Wing Cdr. J. O. Andrews, D.S.O., M.C., 4.1.37. J. L. Vachell, M.C., to R.A.F. Station, Leconfield; to command, 3.1.37. A. S. Maskell, to Aircraft Park, Lahore, India; to command vice Group Capt. J. H. D'Albiac, D.S.O., 11.12.36.

Squadron Leaders.—F. G. A. Robinson, D.F.C., to Electrical and Wireless School, Cranwell; for Administrative duties, 14.1.37. P. R. Barwell, to No. 46 (Fighter) Squadron, Kenley; to command, 4.1.37. R. S. Bruce, M.B.E., to Headquarters, No. 17 (Training) Group, Lee-on-the-Solent; for Armament duties, 1.1.37. W. A. D. Brook, to No. 208 (Army Co-operation) Squadron, Heliopolis, Egypt; to command, 11.12.36. J. G. Hawtrey, to Headquarters, R.A.F., India, New Delhi; for course at the Staff College, Quetta, 1.1.37. A. H. Love, to Headquarters, No. 3 (Bomber) Group, Mildenhall; for Air Staff duties, 4.1.37. C. S. Riccard, to Headquarters, Fighter Command, Stanmore; for Personnel Staff duties vice Sqn. Ldr. J. F. T. Barrett, D.S.O., D.F.C., 4.1.37. J. R. I. Scambler, A.F.C., to Headquarters, No. 6 (Auxiliary) Group, London; for duty as Senior Personnel Staff Officer vice Wing Cdr. W. K. Mercer, 2.1.37. D. L. Thomson, to No. 9 Flying Training School, Thornaby; for Administrative duties vice Sqn. Ldr. C. R. Smythe, 4.1.37.

Flight Lieutenants.—J. Goodhart, to R.A.F. Station, Upper Heyford, 24.12.36. E. D. MacK. Nelson, to No. 10 Flying Training School, Tern Hill, 24.12.36. T. H. L. Nicholls, to No. 12 (Bomber) Squadron, Andover, 4.1.37. F. A. A. H. Strath, to No. 3 Armament Training Camp, Sutton Bridge, 4.1.37. A. P. Chamberlain, D. Price, J. K. Rotherham, to Home Aircraft Depot, Henlow, 3.1.37. H. M. Pearson, to Special Duty List; on appointment as Assistant Air Attaché, Paris, 22.12.36. R. H. E. Emson, to No. 1 Armament Training Camp, Catfoss, 1.1.37. M. L. Heath, to Air Armament School, Eastchurch, 1.1.37. R. J. P. Morris, to Director of Technical Development, Air Ministry, 4.1.37. H. L. Patch, to No. 4 Armament Training Camp, West Freugh, 1.1.37. L. C. Slee, to Air Armament School, Eastchurch, 28.12.36. H. R. Graham, to R.A.F. Station, Heliopolis, Egypt, 14.12.36. S. R. Groom, M.B.E., to No. 6 (Bomber) Squadron, Ismailia, Egypt, 19.12.36. R. C. Mead, to No. 28 (Army Co-operation) Squadron, Ambala, India, 1.1.37. R. L. Edward, to No. 6 Flying Training School, Netheravon, 6.1.37.

Flying Officers.—J. W. McGuire, to Aeroplane and Armament Experimental Establishment, Martlesham Heath, 7.1.37. L. P. Gibson, H. M. Styles, to R.A.F. Station, Gosport, 4.1.37. R. H. Waterhouse, to School of Naval Co-operation, Lee-on-the-Solent, 4.1.37.

Pilot Officers.—B. B. Jupp, R. G. Forshaw, J. C. Halley, H. D. Jones, P. A. Lombard, D. McIntyre, to School of Naval Co-operation, Lee-on-the-Solent, 4.1.37. K. C. Gill, to Air Observers School, North Coates Fitties, 4.1.37. C. N. Swann, to R.A.F. Station, Cardington, 1.1.37. W. H. R. N. Newton-Howes, D. G. Warren, to No. 218 (Bomber) Squadron, Upper Heyford, 4.1.37. J. Culliford, M. W. Hamlyn, P. D. Holder, to No. 108 (Bomber) Squadron, Upper Heyford, 4.1.37. N. A. F. Cheesman, to No. 104 (Bomber) Squadron, Hucknall, 4.1.37.

Acting Pilot Officers.—J. L. Nicol, to No. 47 (Bomber) Squadron, Khartoum, 16.12.36. L. M. Craigie Halkett, to No. 6 Flying Training School, Netheravon, 15.12.36. E. F. Pope, C. A. Stephen, to No. 30 (Bomber) Squadron, Dhibban, Iraq, 15.12.36. J. Gillan, I. G. C. Malcolm, to No. 55 (Bomber) Squadron, Hinaidi, Iraq, 15.12.36. J. A. Mackie, S. J. Monroe, to No. 70 (Bomber Transport) Squadron, Hinaidi, Iraq, 15.12.36. W. K. Williams, to No. 84 (Bomber) Squadron, Shaibah, Iraq, 15.12.36. F. E. Williams, to No. 84 (Bomber) Squadron, Upper Heyford, 4.1.37. T. Rowland, S. T. Meares, to No. 74 (Fighter) Squadron, Hornchurch, 4.1.37. A. Beck, R. J. Oxley, to No. 218 (Bomber) Squadron, Upper Heyford, 4.1.37.

Equipment Branch

Flying Officers.—E. G. Ambridge, to R.A.F. Station, Catterick, 30.12.36. S. G. Walker, to Stores and Supplies, Aden, 1.12.36.

Pilot Officers.—The undermentioned are posted to School of Storekeeping, Cranwell, on appointment to permanent commissions as Pilot Officers (on probation) with effect from 1.1.37:—A. Macll. Aberdein, D. J. Barber, J. P. Cody, F. P. Dawson, R. H. E. Downe-Brenan, E. G. Farthing, W. R. Ford, E. G. C. Gilbert, A. J. Gouldy, R. R. Goodbody, R. F. B. Guy, R. P. Norman, B. R. Simmons, P. N. Sowman, C. T. Wardman.

Accountant Branch

Flying Officer.—G. L. Seabrook, to No. 208 (Army Co-operation) Squadron, Heliopolis, Egypt, 16.12.36.

Medical Branch

Squadron Leader.—P. H. Perkins, to R.A.F. Station, Ismailia, Egypt, 18.12.36.

Flight Lieutenants.—L. S. Everett, to Headquarters, R.A.F., Middle East, Cairo, Egypt, 17.12.36. F. H. Peterson, to No. 4 Flying Training School, Abu Sueir, Egypt, 17.12.36.

Flying Officers.—R. M. Outfin, to No. 1 Armament Training Camp, Catfoss, 4.1.37. D. G. Smith, to No. 3 Armament Training Camp, Sutton Bridge, 12.1.37.

Commissioned Photographic Officers

Flying Officer.—F. C. Crody, to Headquarters, No. 6 (Auxiliary) Group, London; on appointment to a commission as Flying Officer (Commissioned Photographic Officer), on transfer from the Equipment Branch, with effect from 25.12.36.

Commissioned Engineer Officers

Flying Officers.—S. W. Birch, to Reception Depot, West Drayton, 4.1.37. H. R. Clowes, to No. 11 Flying Training School, Wittering, 4.1.37.

Chaplains Branch

Revd. E. C. Jones, to R.A.F. Station, Halton, 5.1.37.